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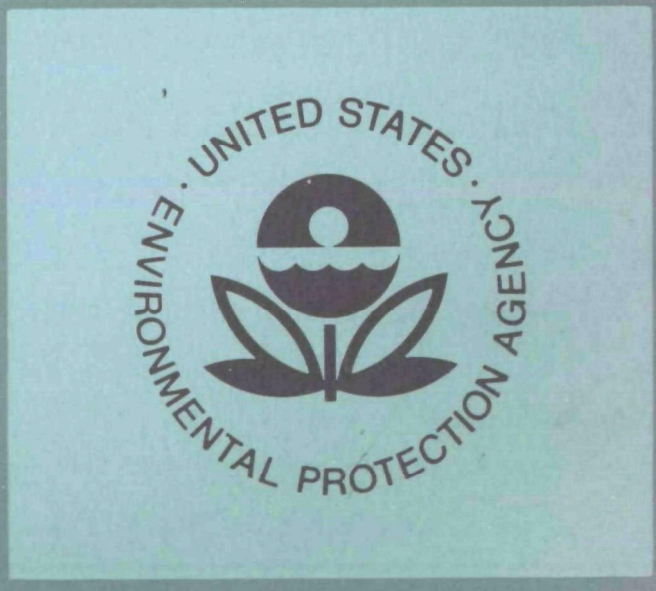
Environmental Protection Technology Series

PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW
Volume IV. Data Analysis Utility Programs



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PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW

VOLUME IV

DATA ANALYSIS UTILITY PROGRAMS

by

Bureau of Reclamation
Engineering and Research Center
Denver, Colorado 80225

EPA-IAG-D4-0371

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FOREWORD

The Environmental Protection Agency was established to coordinate administration of the major Federal programs designed to protect the quality of our environment.

An important part of the Agency's effort involves the search for information about environmental problems, management techniques and new technologies through which optimum use of the Nation's land and water resources can be assured and the threat pollution poses to the welfare of the American people can be minimized.

EPA's Office of Research and Development conducts this search through a nationwide network of research facilities.

As one of these facilities, the Robert S. Kerr Environmental Research Laboratory is responsible for the management of programs to: (a) investigate the nature, transport, fate and management of pollutants in groundwater; (b) develop and demonstrate methods for treating wastewaters with soil and other natural systems; (c) develop and demonstrate pollution control technologies for irrigation return flows; (d) develop and demonstrate pollution control technologies for animal production wastes; (e) develop and demonstrate technologies to prevent, control or abate pollution from the petroleum refining and petrochemical industries; and (f) develop and demonstrate technologies to manage pollution resulting from combinations of industrial wastewaters or industrial/municipal wastewaters.

This report contributes to the knowledge essential if the EPA is to meet the requirements of environmental laws that it establish and enforce pollution control standards which are reasonable, cost effective and provide adequate protection for the American public.

William C. Galegar
Director
Robert S. Kerr Environmental
Research Laboratory

PREFACE

This report is one of a set which documents the development and verification of a digital computer modeling effort to predict the mineral quality changes in return flows occurring as a result of irrigating agricultural lands. The set consists of five separate volumes under one general title as follows:

"Prediction of Mineral Quality of Irrigation Return Flow"

Volume I. Summary Report and Verification

Volume II. Vernal Field Study

Volume III. Simulation Model of Conjunctive Use and Water Quality for a River System or Basin

Volume IV. Data Analysis Utility Programs

Volume V. Detailed Return Flow Salinity and Nutrient Simulation Model

This set of reports represents the culmination of an effort started in May 1969 by an interagency agreement between the U.S. Bureau of Reclamation and the Federal Water Pollution Control Administration on a joint research proposal on the "Prediction of Mineral Quality of Return Flow Water from Irrigated Land." This research project has had three different project identification numbers during the project period. These numbers (13030 EII, EPA-IAG-048-(D), and EPA-IAG-D4-0371) are given to avoid confusion on the part of individuals who have previously tried to acquire project reports for the earlier project numbers.

ABSTRACT

This volume of the report contains a description of the data analysis subroutines developed to support the modeling effort described in Volume III. The subroutines were used to evaluate and condition data used in the conjunctive use model. The subroutines include (1) regression analysis, (2) Gaussian probability function, (3) Beta distribution, and (4) Pearson's incomplete gamma function. For each of these subroutines, a brief theory is given plus a program listing and sample problem.

This report was submitted in fulfillment of EPA-IAG-D4-0371 by the Bureau of Reclamation, Engineering and Research Center, under the sponsorship of the Environmental Protection Agency.

CONTENTS

INTRODUCTION

Hydrology and related fields have a continued requirement for various tools of modern statistical theory. Most of the tools are needed for the examination, extension, and analyses (time series) of different forms of basic or observed data.

Prior to the advent of the electronic computer the extensive use of the techniques of modern statistics was prohibitive because of the many laborious and tedious hand computations. However, as computer technology advanced, resulting in greater computation speeds and larger rapid access storage facilities, the usage of these statistical techniques grew as various forms of computer applications.

It is obvious that no one tool will solve all problems encountered in the analysis of hydrologic data. Further, a comprehensive computer package that was portable and not exclusively propertied was beyond the scope of a reasonable effort both in time and money. Within the limits of a reasonable effort it was determined that a computer package composed of computer applications of regression analyses, tools for the solutions of the normal, beta, and gamma distributions would be a good initial step. Many of the other tools of modern statistical theory such as chi-square tests, Markovian analyses, and pseudo-distribution functions, to name a few, are extensions of the tools contained in this computer package.

In the subsequent narrative a brief description is given of some of the applications of these statistical tools in the field of hydrology.

REGRESSION ANALYSIS

The computer application of this regression analysis has been designed to be interactive with a terminal. The interactive feature provides easy access to the computer and reduces the narrative required in terms of a user's guide.

Regression analyses are used extensively in the field of hydrology in the manipulation and extension of data. In this respect, the computer application was adapted to fit the more common needs of the practiced hydrologist with some fundamental skill in statistics. This adaptation does not, however, preclude other uses of the regression analysis for problem-solving in areas not related to hydrology.

The subsequent discussion will concern the various features of the computer application and, where necessary, a brief explanation of statistical theory will be included.

Data Input

The input data are limited to a maximum of 11 variables, one of which is the dependent variable and the remaining 10 are the independent variables. The maximum number of observations (data points) is 500. The two maxima were chosen to fit the majority of hydrology applications.

Each variable must have a title and must also have a reference index of at least one and not more than two digits.

The entry of the above data can be accomplished by any one of two choices. When the sample size is relatively small and the number of variables are few, entry of the data via the terminal is more expedient. Data entered in this manner will be formatted internally and written on an output file labeled OUTO. The internal format used in this case is compatible to that required when data are entered via a read device.

The remaining means of data entry is via a read device. The input file name for the read device is labeled OUTA. Entry of data via the read device is more expedient when the sample size (number of data points) is large, the number of variables many, and where variables are transformed prior to entry into the regression analysis. Surface responses are cases in particular where simple stand-alone mechanisms would be a judicious choice of transformation of variables prior to data entry.

The format required for entry of data concerning the variables is as follows:

Variable title (first line) - 1X,7A10,A9

Variable index and number of data points (second line) - 9X,I3,6X,I3

Data points for variable (third, ...,lines) - 1X,6F13.0/(1X,6F13.0)

Data points must include decimal point in field, if applicable.

The title of the variable is stored in a two-dimensional array labeled LTITLE, the index of the variable is stored in a single-dimensional

array labeled MVAR, the data points are stored in a two-dimensional array titled XOB, and the number of data points are stored in a single-dimensional array labeled NPX. A check is made to determine if all variables entered have the same number of data points and when this check fails, a program-controlled error message is displayed at the terminal, otherwise the number of data points entering the regression analysis is stored with the label NP.

All other information pertinent to the regression analysis is entered via the terminal as responses to queries displayed at the terminal. Whenever the query requires a "yes" or "no" response, any single character will suffice for the "no" response; however, the "yes" response must be the three alpha characters YES.

The query format as displayed at the terminal is self-explanatory and the response required is direct, hence any discussion in this respect would be redundant.

Output Files

The computer application for the regression analysis has provisions for three output files. The file assigned the label OUTPUT is used for all queries displayed at the terminal as well as the display of all error messages displayed at the terminal that are program generated.

The output file assigned the label OUTA is used to store the formatted data, i.e., variable name, index, and data points as accepted via terminal input.

The output file assigned the label OUTB is used to store the results of regression analysis, the intermediate matrices and the residual lists. Options are provided to write the intermediate matrices and residual lists. The intermediate matrices are the (1) raw sums of squares and products (A matrix), (2) covariances (C matrix), and (3) simple coefficients of regression.

The residuals can be listed at each step of the regression analysis. A list of variables from the input set will always be included as part of this output file.

Program Structure

The program (electronic computer application) structure is composed of the main program and four subroutines and requires approximately $115{,}000_8$ words to load. The program can be used as a stand-alone application or can be used as five subroutines where four remaining subroutines are monitored by the main subroutine or program.

Main Program - REGRES

The main program monitors all subroutines and nearly all of the terminal queries are contained in the main program.

Problem Title

The problem title can be represented with at least one line (79 or less characters per line) or with as many as five lines. The number of lines are stored under the label NTITLE and the lines of

title information are stored in a two-dimensional array labeled KTITLE. The lines are entered left justified and will be centered internally on the basis of an 80-character line.

Variable Sequence

The variable sequence is controlled by the order in which each variable is entered at time of input either via terminal or read device. The variable sequence is stored in a single-dimensional array labeled KRANK. The variable sequence can be changed and only selected variables within the input data set will be allowed to enter the regression analysis. When selected variables are not a part of the input data set, a program-controlled error message will be displayed at the terminal. The index of the dependent variable is stored under the label KVAR.

Variable Transformation

The purpose of variable transformation is to use a simple linear regression model in terms of the transformed variables rather than a more complicated model in terms of the original variables. When a nonlinear model, defined as nonlinear in parameters to be estimated, can be expressed by adequate transformation of variables in the form of a linear model, it is referred to as being intrinsically linear, and such is the limitation of suitable transforms. This particular computer application of a regression analysis has purposely been further constrained by allowing only six rather simple transformations

to be accomplished internally. These six transforms are as follows:

Form	Alpha configuration
$X'_{ij} = \log X_{ij}$	LOG10
$X'_{ij} = \ln X_{ij}$	LOGE
$X'_{ij} = \sqrt{X_{ij}}_a$	SQRT
$X'_{ij} = X_{ij}$	EXP
$X'_{ij} = \sin X_{ij}$	SIN
$X'_{ij} = \cos X_{ij}$	COS

The above transforms are those most commonly used in hydrology where the sine and cosine transforms are a bit far out and the log and ln transforms seem redundant where one can be expressed in terms of the other. In any event, the computer application can be easily modified to discard and replace some of the six transforms listed above or number of transforms performed internally can be expanded to as many as 10.

The alpha configurations of the transforms are stored in a single dimensional array labeled ITRANS.

When it is desirable to represent a "k^{th}" order model - single independent variable, another alpha configuration is used. This alpha configuration is the three-character signal POW. The response to this signal will be a query concerning the degree (order) of the polynomial.

The exponents or order of polynomial are stored in the single dimensional array EXPO.

The use of transformed variables should be investigated with an examination of the residuals as obtained as a result of the regression equation. An aid in this examination has been provided by listing the residuals when the dependent variable has been transformed in terms of the original independent variable (exception sine and cosine).

F Levels

Each of the observations of the dependent variable are random variables, hence all variables that are functions of this set are also random variables. These two functions are the mean square due to the regression and the mean square of the residuals. Both functions have particular distributions, means, variance, and moments. Assume that the errors (deviations) ε_i are independent, i.e., $N(0,\sigma^2)$ variables, and also that it can be demonstrated that mean square due to the regression multiplied by its degrees of freedom (regression) and the mean square of the residuals multiplied by its degrees of freedom (residual), both will follow a chi-square distribution. It can also be shown that the two variables are independent. Without further discussion it can be said that:

$$F = \frac{\text{mean square due to regression}}{\text{mean square due to residuals}}$$

represents the F ratio and said ratio follows an F distribution.

Nearly all statistical texts or handbooks have tables for the 1 percent (99 percent) and 5 percent (95 percent) F levels.

The regression analysis as represented by this computer application has provision for the entry of F levels. The F level to enter a variable in the regression is stored under the label FLEVEN and the F level to exclude a variable from the regression is stored under the label FLEVRE.

When no F level is given the variables enter the regression in the sequence stored in the array KRANK.

The F level to exclude a variable from the regression should always be less than or equal to the F level to enter a variable in the regression.

It is suggested that one assume two degrees of freedom for the regression and twenty degrees (>20 data points) to estimate F levels. Under such an assumption use F level $\sim$ 3.5 for 5 percent (95 percent) and F level $\sim$ 6.0 for 1 percent (99 percent).

Ranking of Data Points

This application has the provision to rank the data points (observations) by magnitude. In some hydrology studies this sort of license is taken without statistical justification. One would have to possess a keen knowledge of the observed data to use this facet with a linear model. However, the mechanism to do the ranking is a good tool in setting up distribution studies.

The alpha signal to rank in ascending order of magnitude is LOW and to rank in descending order of magnitude the alpha signal is HIGH. These alpha signals are stored in a single dimensional array labeled IRANK.

Miscellanea

The number of variables entered during input is stored under the label KCONT. The number of variables in regression analysis is stored under the label KNUM. Intermediate storage of ranked data points is provided by the single dimensional array labeled XSORT.

Subroutine VARTRN

This subroutine is a simple setup mechanism for the six transformations. The argument list is as follows:

KA = Order of variable to be transformed
NUM = Number of data points
KTRAN = Order in the transform list
EXPP = Exponent, if any

All variables are shoved through this subroutine even though no transform is desired. The data points for each variable (transformed or raw) are stored in a two dimensional array labeled XRT. All data ranking, if required, is completed before entry to this subroutine.

Subroutine PRESRT

This subroutine is used for the sole purpose of setting the indices JB and KB in preparation of the quadratic sort mechanism used in ranking the data points by magnitude.

Subroutine SORT

This subroutine is used to rank the data points in terms of magnitude. The subroutine uses a quadratic sort mechanism. Detailed discussion of this subroutine is not considered pertinent with respect to the regression analysis.

Subroutine REGCOR

This subroutine contains the actual computational sequence of the regression model. Before discussion of the details of this subroutine it might be wise to begin with a little of the philosophy of the linear model where the model has the following form:

$$y = a_o + a_1x_1 + a_2X_2 + \ldots + a_nx_n + \varepsilon \quad (0 < n < 11)$$

where: ε represents the residual and every other term on the right side of the equation represents the regression.

The fundamental notion is to complete the regression of all the variables as a series of straight line regressions where each of the straight line regressions represents a step,or as some say, stage.

The first computational effort is to determine the previously mentioned A matrix which contains the sums and cross products of all the variables in the regression, including the dependent variable.

The second computational effort is to determine the covariances of all the variables, which is the previously mentioned C matrix.

The third computational effort is to determine the simple correlation coefficients of all the variables, which is the previously mentioned R matrix.

The next and final computational effort prior to the initiation of the straight line regressions or steps is to augment the R matrix in the following manner (n = number of independent variables):

$$B = \begin{bmatrix} R(n \times n) & T'(n \times 1) & I(n \times n) \\ T(1 \times n) & S(1 \times 1) & 0(1 \times n) \\ -I(n \times n) & 0(n \times 1) & 0(n \times n) \end{bmatrix}$$

where: R(n x n) = matrix of simple correlation coefficients

T(1 x n) = correlation vector with response to dependent variable

-I(n x n) = negative identity matrix

T'(n x 1) = transpose of T

S(1 x 1) = correlation of response with itself ($R_{yy} \equiv 1$)

I(n x n) = identity matrix

As an example, consider the following model:

$$y = a_o + a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + \varepsilon$$

then:

$$B = \left[\begin{array}{cccc:c:cccc} R_{11} & R_{12} & R_{13} & R_{14} & R_{1y} & 1 & 0 & 0 & 0 \\ R_{21} & R_{22} & R_{23} & R_{24} & R_{2y} & 0 & 1 & 0 & 0 \\ R_{31} & R_{32} & R_{33} & R_{34} & R_{3y} & 0 & 0 & 1 & 0 \\ R_{41} & R_{42} & R_{43} & R_{44} & R_{4y} & 0 & 0 & 0 & 1 \\ \hdashline R_{y1} & R_{y2} & R_{y3} & R_{y4} & \equiv 1 & 0 & 0 & 0 & 0 \\ \hdashline -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

The B matrix is used to determine the F level of each of the independent variables and choosing that independent variable with the highest F level to enter the regression, if this F level is equal to or greater than the critical F level for entry. The computation of the F level is as follows:

Let: V be a measure of variance

DEGF - degrees of freedom of the residual

then: $V_i = (B_{i,n+1})(B_{i,n+i})/B_{i,i} \quad i = i, \ldots, n$

$$F_i = V_i \ (DEGF)/(B_{n+1,n+1} - V_i) \quad i = 1, \ldots, n$$

Initially the degrees of freedom for the regression equals zero and the degrees of freedom for the residual = NP-1, where NP = number of data points (observations).

The mechanism used in updating the B matrix (augmented R matrix) as each variable enters the regression and the updating of the B matrix after a variable has been excluded from the regression will be discussed in a subsequent portion of this narrative.

Continuing with the philosophy, it might be well to examine a few transformations of variables and the resulting models.

No Transformations (1)

$y = a_o + a_1x + \varepsilon$ - one independent variable

$y = a_o + a_1x_1 + a_2x_2 + \varepsilon$ - two independent variables

$y = a_o + a_1x_1 + a_2x_2 + \ldots + a_nx_n + \varepsilon$ - n independent variables

Logarithmic Transformations (2)

$\ln y = \ln a_o + a_1 \ln x + \varepsilon$

$\log y = \log a_o + a_1 \log x + \varepsilon$

} one independent variable

$y = a_o + a_1 \ln x_1 + a_2 \ln x_2 + \varepsilon$ - two independent variables

Square Root Transformations (3)

$$y = a_o + a_1 x_1^{1/2} + a_2 x_2^{1/2} + \varepsilon \text{ - two independent variables}$$

One Independent Variable (4)

$$y = a_o + a_1 x + a_2 x^2 + \varepsilon \text{ - second-order models}$$

$$y = a_o + a_1 x + a_2 x^2 + \ldots + a_k x^k + \varepsilon \text{ - } k^{th} \text{ order models}$$

Two Independent Variables (5)

$$y = a_o + a_1 x_1 + a_2 x_2 + a_3 x_1^2 + a_4 x_2^2 + a_4 x_1 x_2 + \varepsilon \text{ - second-order models - surfaces}$$

$$y = a_o + a_1 x + a_2 x_2 + a_3 x_1^2 + a_4 x_1 x_2 + a_5 x_2^2 + a_6 x_1^3 + a_7 x_1^2 x_2 + a_8 x_1 x_2^2 + a_9 x_2^3 + \varepsilon \text{ - third-order models - surfaces}$$

The above examples of transformations are but a few of the many that are possible. However, the examples should display the general idea of transformations.

Transformations (1), (2), (3), and (4) are handled by the computer application. Transformation (5) can be accomplished by manipulation of the input data file with a stand-alone technique. It can be seen that a third-order model of a surface would be near the limitation of 10 independent variables.

Algorithms - Updating B Matrix

Let k = index of variable entering regression

n = number of independent variables

i = 1,2, ..., 2n-1

j = 1,2, ..., 2n-1

$$B_{ij} = D_{kj}/D_{kk} \quad i = k$$

$$B_{ij} = D_{ij} - D_{ik}.D_{kj}/D_{kk} \quad i \neq k$$

Let k = index of variables excluded from regression

n = number of independent variables

$\ell = k + n+1$

m = 2n-1

i = 1,2, ..., 2n-1

j = 1,2, ..., 2n-1

$$B_{ij} = D_{ij}/D_{\ell m} \quad i = k$$

$$B_{ij} = D_{ij} - D_{im}.D_{mj}/D_{\ell m} \quad i \neq k$$

Update k^{th} vector

i = 1,2, ..., 2n-1

$$B_{ik} = D_{ik} - D_{im}/D_{\ell m}$$

Note: The D matrix is an exact image of the B matrix from the previous step (stage)

Labels

Item	Array
A matrix	A(11,11)
B matrix	B(21,21)
C matrix	C(11,11)
D matrix	D(21,21)
R matrix	R(11,11)
Independent variables	X(11,500)
Dependent variables	Y(500)
Students T value	STUDT(11)
Standard deviation	STDEV(11)
Partial F values	PARFL(11)
Regression coefficients	REGCOF(10)
Variables in regression	KIN(11)
F levels	FLEV(11)
Variables not in regression	KOUT(11)
Original variable index	KSETS(11)
Variances	V4(11)
Degrees of freedom - regression	NSTEP
Degrees of freedom - residual	IDEG,DEGF
Step or stage of regression	NSTEP

All other labels are self-explanatory.

Statistics

Let n = number of independent variables

m = n+1

$B = \begin{bmatrix} \quad \end{bmatrix}$, $C = \begin{bmatrix} \quad \end{bmatrix}$

Original variance (ORGVAR) independent variable = C_{mm}

Percent explained variance (PEREXP) = $(1 - B_{mm})(100)$

Percent unexplained variance (PERUNE) = $B_{mm}(100)$

Multiple correlation coefficient (RMULT) = $\sqrt{1.0 - B_{mm}}$

Residual sum of squares (RESQR) = $C_{mm} \cdot B_{mm}$

Standard error of residuals (STDRES) = $\sqrt{RESQR/DEGF}$

Let k = index of variable

$\ell = k + m$

KJI = number of variables in regression

i = 1,2, ..., KJI

Regression coefficient (REGCOF(i)) = $B_{im}\sqrt{C_{mm}/C_{ii}}$

Standard error (STDREG(i)) = STDRES $\sqrt{B_{\ell\ell}/C_{ii}}$

Partial F value (PARFL(i)) = DEGF $(B_{im})^2/B_{mm} \cdot B_{\ell\ell}$

The partial F value is tested against critical F level to exclude a variable from the regression because of a nonsignificant contribution to the response of the dependent variable.

Regression Analysis References

1. N. R. Draper, H. Smith, Applied Regression Analysis, Second Printing, 1967, John Wiley and Sons, Inc., New York, London, Sydney.

2. R. S. Burington, D.C. May, Jr., Handbook of Probability and Statistics with Tables, 1953, Handbook Publishers, Inc., Sandusky, Ohio

3. M. A. Efroymson, "Multiple regression analysis," Chapter 17, Mathematical Methods for Digital Computers, Ralston and Wilf, Second Printing, 1962.

```
      PROGRAM REGRES(INPUT,OUTPUT,OUTA,OUTB,OUTD,TAPE5=OUTA,TAPE6=OUTB,
     1TAPE7=OUTD)
      COMMON/VARBLS/ XOB(11,500), XRT(11,500)
      COMMON/TITLES/KTITLE(5,8), LTITLE(11,8),NTITLE
      COMMON/INDICE/KCONT,KNUM,IDY,FLEVEL,NP,CIT,COT,IXR
      COMMON/KEYS/IRANK(11),ITRANS(11),EXPO(11),KSORT(11),KRANK(11)
      DIMENSION MTEST(10) , NPX(11),IFORM(2),ITEM(8),KTEM(8),XSORT(500)
      DIMENSION MVAR(11),NFORM(2)
      INTEGER CIT,COT
      DATA((MTEST(K),K=1,10)=5RLOG10,5RLOGE ,5RSQRT ,5REXP  ,5RSIN  ,
     1  5RCOS  ,  4*5R     )
      DATA(KTEST=3105238)
      CIT=5 $ COT=6 $ IXR=7 $ ISW=0
      PRINT 10
   10 FORMAT(2X*THIS IS A REGRESSION ANALYSIS PACKAGE WITH*
     1  /2X*A MAXIMUM NUMBER OF ELEVEN VARIABLES*)
      ISW=0
      KCONT=0
      DO 20 K=1,11
      MVAR(K)=0
      NPX(K)=0
      IRANK(K)=0
      ITRANS(K)=0
      EXPO(K)=0.0
      KSORT(K)=0
      KRANK(K)=0
   20 CONTINUE
   30 FORMAT(R3)
   35 PRINT 37
   37 FORMAT(2X*DO YOU WANT TO ENTER ANOTHER VARIABLE - YES OR NO*)
      READ 30,ITEST
      IF(ITEST.NE.KTEST) GO TO 100
      PRINT 39
   39 FORMAT(2X*DO YOU WANT TO ENTER VARIABLE VIA TERMINAL-YES OR NO*)
      READ 30,ITEST
      IF(ITEST.EQ.KTEST) GO TO 59
      IF(ISW.NE.1) GO TO 43
      PRINT 41
   41 FORMAT(2X*YOU ARE ATTEMPTING TO READ BEYOND EOF--JOB ABORTED*)
      CALL EXIT
   43 ISW=1
      PRINT 45
   45 FORMAT(2X*YOU WILL READ VARIABLE STRING FROM FILE ON UNIT*
     1  /2X*FIVE-FORMAT(TITLE/INDEX/VARIABLE LIST(1X,6F13.0)*
     2  /2X*DECIMAL POINT MUST BE IN FIELD*)
   46 READ(CIT,49)ITEM
   49 FORMAT(1X,7A10,A9)
      IF(EOF(CIT)) 35,51
   51 READ(CIT,53)INDEX,NA
   53 FORMAT(9X,I3,6X,I3)
      KA=KCONT=KCONT+1 $ NPX(KA)=NA $ MVAR(KA)=INDEX
      IF(KCONT.GT.11) GO TO 1020
      DO 55 K=1,8
      LTITLE(KA,K)=ITEM(K)
   55 CONTINUE
      READ(CIT,57)(XOB(KA,K),K=1,NA)
   57 FORMAT(1X,6F13.0/(1X,6F13.0))
```

```
      PRINT 58,INDEX
   58 FORMAT(2X*INDEX = *I3)
   60 GO TO 46
   59 PRINT 60
   60 FORMAT(2X*TYPE IN INDEX OF VARIABLE-(1-11)*)
      KCONT=KA=KCONT+1 $ IF(KCONT.GT.11) GO TO 1020
      READ*,INDEX
   65 PRINT 65
   65 FORMAT(2X*TYPE IN TITLE OF VARIABLE*)
      READ 67,(LTITLE(KA,K), K=1,8)
      WRITE(IXR,49)(LTITLE(KA,K),K=1,8)
   67 FORMAT(7A10,A2)
   70 MVAR(KA)=INDEX $ JX=0
      PRINT 70
   70 FORMAT(2X*ENTER VARIABLE SET -INCLUDE DECIMAL POINT*/
     1  2X*END WITH A CARRIAGE RETURN*)
   75 READ *, TEMPX
   75 IF(EOF(5LINPUT)) 95,80
   80 JX=JX+1
      XOB(KA,JX)=TEMPX
      GO TO 75
   85 FORMAT(1X*INDEX = *I3,6X,I3)
   90 FORMAT(1X,6F13.6/(1X,6F13.6))
   95 NPX(KA)=JX
      WRITE(IXR,85)INDEX,JX
      WRITE(IXR,90)(XOB(KA,K),K=1,JX)
      GO TO 35
  100 PRINT 102
  102 FORMAT(2X*ARE ALL VARIABLES ENTERED TO BE IN ANALYSIS WITHOUT*
     1  /2X*TRANSFORMS OR RANKING-YES OR NO*)
      READ 30,ITEST
      IF(ITEST.NE.KTEST) GO TO 104
      DO 103 K=1,KCONT
      KRANK(K)=MVAR(K)
      ITRANS(K)=5ROUT
  103 CONTINUE
      KNUM=KCONT
      GO TO 160
  104 PRINT 105
  105 FORMAT(2X*ENTER INFORMATION FOR REGRESSION ANALYSIS*)
      KNUM=0
  110 PRINT 115
  115 FORMAT(2X*DO YOU WANT TO ENTER MORE INFORMATION-YES OR NO*)
      READ 30,ITEST
      IF(ITEST.NE.KTEST)  GO TO 160
      KNUM=KNUM+1
      PRINT 120
  120 FORMAT(2X*ENTER INDEX OF VARIABLE*)
      READ*,INDEX
      DO 125 K=1,11
      IF(INDEX.NE.MVAR(K)) GO TO 125
      KA=K
      GO TO 135
  125 CONTINUE
      PRINT 130
  130 FORMAT(2X*THIS INDEX IS NOT IN DATA SET--ABORTED--*)
      CALL EXIT
```

```
      135  KRANK(KNUM)=MVAR(KA)
           PRINT 140
      140  FORMAT(2X*ENTER TRANSFORM OR (CR)*)
           READ 145,KTYPE
           IF(EOF(5LINPUT))141,146
      141  KTYPE=5ROUT
           GO TO 146
      145  FORMAT(R5)
      146  ITRANS(KA)=KTYPE $ JTEST=SHIFT(KTYPE,-12) $ JTEST=JTEST.AND.778
           EXPO(KA)=0.0 $ IF(JTEST.NE.208) GO TO 149
           PRINT 147
      147  FORMAT(2X*ENTER EXPONENT-DECIMAL POINT INCLUDED*)
           READ*,EXPO(KA)
           GO TO 153
      149  IF(JTEST.NE.278) GO TO 153
           PRINT 151
      151  FORMAT(2X*ENTER DEGREE OF POLYNOMIAL*)
           READ*,IDEG
           EXPO(KA)=IDEG
      153  PRINT 155
      155  FORMAT(2X*ENTER RANKING INDEX(HIGH,LOW OR (CR)*)
           READ 157,IRANK(KA)
           IF(EOF(5LINPUT))156,158
      156  IRANK(KA)=4R
           GO TO 158
      157  FORMAT(R4)
      158  IF(IRANK(KA).NE.4R     ) KSORT(KA)=1
           GO TO 110
      160  PRINT 165
      165  FORMAT(2X*ENTER INDEX OF DEPENDENT VARIABLE*)
           READ*,ITEST
           DO 167 K=1,11
           IF(ITEST.NE.MVAR(K)) GO TO 167
           KVAR=K
           GO TO 181
      167  CONTINUE
           PRINT 169
      169  FORMAT(2X* DEPENDENT VARIABLE NOT IN DATA SET--ABORTED--*)
           CALL EXIT
      181  DO 185 K=1,KCONT
           IF(KSORT(K).EQ.0) GO TO 185
           DO 182 L=1,500
           XSORT(L)=0.0
      182  CONTINUE
           NS=NPX(K)
           DO 183 L=1,NS
           XSORT(L)=XOB(K,L)
      183  CONTINUE
           CALL PRESRT(XSORT,NS,IRANK(K))
           DO 184 L=1,NS
           XOB(K,L)=XSORT(L)
      184  CONTINUE
      185  CONTINUE
           NP=NPX(1)
           DO 190 K=2,KCONT
           KB=K $ IF(NPX(K).NE.NP) GO TO 200
      190  CONTINUE
```

```
      GO TO 220
  200 PRINT 210,MVAR(KB),NPX(KB)
  210 FORMAT(2X*NO. OF POINTS ARE BAD*/
     1 *VARIABLE INDEX = *I4,2X*NO. OF POINTS = *I4)
      CALL EXIT
  220 MIN=1 $ MAX=KCONT $ MSW=0 $ LINE=0
      IF(MAX.LT.7) GO TO 221
      MSW=1 $ MAX=6
  221 KOT=MAX-MIN+1 $ IFORM(1)=20H
      ENCODE(19,223,IFORM)KOT
      NFORM(1)=IFORM(1) $ NFORM(2)=IFORM(2)
      DO 226 J=1,NP
      IF(LINE.NE.0) GO TO 224
      WRITE(COT,222)
  222 FORMAT(1H1,///1X*LIST OF INPUT VARIABLES*//)
      WRITE(COT,NFORM)(MVAR(JA),JA=MIN,MAX)
  223 FORMAT(4H(1X,I1,14H(8X,*X(*I2*)*))
  224 WRITE(COT,225)(XOB(JB,J),JB=MIN,MAX)
  225 FORMAT(1X,6F13.6)
      LINE=LINE+1 $ IF(LINE.GT.50) LINE=0
  226 CONTINUE
      IF(MSW.EQ.0) GO TO 248
      MIN=7 $ MAX=KCONT $ LINE=0 $ GO TO 221
  248 PRINT 249
  249 FORMAT(2X*DID YOU ENTER VARIABLES IN THE ORDER*/
     1  2X*YOU WOULD LIKE THEM TO ENTER ANALYSIS*/2X*TYPE YES OR NO*)
      READ 30,ITEST
      FLEVEL=99.0
      IF(ITEST.EQ.KTEST) GO TO 270
  250 PRINT 260
  260 FORMAT(2X*TYPE F LEVEL TO ENTER(COMMA) AND F LEVEL TO REMOVE*)
      READ*,FLEVEN,FLEVRE
  270 PRINT 280
  280 FORMAT(2X*ENTER NUMBER OF TITLE CARDS*)
      READ*,NTITLE
      NT = 0
  290 PRINT 300
  300 FORMAT(2X*TYPE IN A TITLE CARD*)
      NT = NT+1
      READ 310, ITEM
  310 FORMAT(8A10)
      IFORM(1)=20H
      LA=8 $ LB=0 $ LC=0
  320 ITEST=ITEM(LA)
  330 JTEST=0 $ JTEST=ITEST.AND.77B
      IF(JTEST.NE.55B) GO TO 350
      ITEST=SHIFT(ITEST,-6) $ LC = LC+ 1
      IF(LC.EQ.10) GO TO 340
      LB=LB+ 1
      GO TO 330
  340 LC=0 $ LA=LA-1 $ IF(LA.LT.1) GO TO 350
      GO TO 320
  350 IF(LB.GT.2) GO TO 370
      DO 360 K=1,8
      KTEM(K)=ITEM(K)
  360 CONTINUE
      GO TO 395
```

```
          370  IB=LB/2 $ IBB=LB-IB
230            IC=80-LB $ ICC=IC/10 $ ICD=IC-(ICC*10)
               IF(ICD.GT.0) GO TO 380
               ICD=1 $ IBB=IBB-1
          380  ENCODE(20,390,IFORM) IB,ICC,ICD,IBB
          390  FORMAT(*(*I2*X,*I2*A10,A*I2*,*I2*X)*)
235            ENCODE(80,IFORM,KTEM)ITEM
          395  DO 400 K=1,8
               KTITLE(NT,K) = KTEM(K)
          400  CONTINUE
               IF(NT.LT.NTITLE) GO TO 290
240            DO 430 J=1,KCONT
               KA=J
               DO 420 K=1,10
               KB=K
               IF(ITRANS(J).NE.MTEST(K)) GO TO 420
245            CALL VARTRN(KA,NP,KB,EXPO(J))
               GO TO 430
          420  CONTINUE
               KB=0 $ CALL VARTRN(KA,NP,KB,EXPO(J))
          430  CONTINUE
250            WRITE(COT,435)
          435  FORMAT(1H1,///1X*PROBLEM INFORMATION*/)
               DO 450 J=1,NTITLE
               WRITE(COT,440)(KTITLE(J,K),K=1,8)
          440  FORMAT(1X,8A10)
255       450  CONTINUE
               WRITE(COT,445)
          445  FORMAT(///8X)
               DO 460 K=1,KNUM
               IDV=KRANK(K)
260            IF(IDV.EQ.0)  GO TO 460
               WRITE(COT,455)IDV,(LTITLE(IDV,L),L=1,8)
          455  FORMAT(1X*X(*I2*) = *7A10,A2)
          460  CONTINUE
               WRITE(COT,470)NP,KNUM,MVAR(KVAR)
265       470  FORMAT(///1X*NUMBER OF EVENTS = *I4,10X*NUMBER OF VARIABLES = *
              1  I4///1X*INDEX OF INDEPENDENT VARIABLE = *I4)
               IF(FLEVEN.EQ.0.0) GO TO 490
               WRITE(COT,480)FLEVEN,FLEVRE
          480  FORMAT(//1X*F LEVEL TO ENTER = *F8.4,5X*F LEVEL TO EXCLUDE = *
270           1  F8.4)
               GO TO 510
          490  WRITE(COT,500)
          500  FORMAT(1X*F LEVELS WERE NOT PART OF INPUT AND WILL NOT BE USED*)
          510  CALL REGCOR(KVAR,FLEVEN,FLEVRE,MVAR)
275            CALL EXIT
         1000  PRINT 1010
         1010  FORMAT(2X*YOU HAVE READ AN EOF IN ERROR*)
               GO TO 2000
         1020  PRINT 1030
280      1030  FORMAT(2X*NUMBER OF VARIABLES GREATER THAN 11*)
         2000  CALL EXIT
               END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
12257 REGRES

VARIABLES	SN	TYPE		RELOCATION					
5	CIT	INTEGER		INDICE	6	COT	INTEGER		INDICE
26	EXPO	REAL	ARRAY	KEYS	3	FLEVEL	REAL		INDICE
14321	FLEVEN	REAL			14322	FLEVRE	REAL		
14327	IB	INTEGER			14330	IBB	INTEGER		
14331	IC	INTEGER			14332	ICC	INTEGER		
14333	ICD	INTEGER			14304	IDEG	INTEGER		
14334	IDV	INTEGER			2	IDY	INTEGER		INDICE
14362	IFORM	INTEGER	ARRAY		14275	INDEX	INTEGER		
0	IRANK	INTEGER	ARRAY	KEYS	14272	ISW	INTEGER		
14364	ITEM	INTEGER	ARRAY		14274	ITEST	INTEGER		
13	ITRANS	INTEGER	ARRAY	KEYS	7	IXR	INTEGER		INDICE
14316	J	INTEGER			14317	JA	INTEGER		
14320	JB	INTEGER			14303	JTEST	INTEGER		
14300	JX	INTEGER			14273	K	INTEGER		
14277	KA	INTEGER			14310	KB	INTEGER		
0	KCONT	INTEGER		INDICE	1	KNUM	INTEGER		INDICE
14315	KOT	INTEGER			54	KRANK	INTEGER	ARRAY	KEYS
41	KSORT	INTEGER	ARRAY	KEYS	14374	KTEM	INTEGER	ARRAY	
13233	KTEST	INTEGER			0	KTITLE	INTEGER	ARRAY	TITLES
14302	KTYPE	INTEGER			14305	KVAR	INTEGER		
14306	L	INTEGER			14324	LA	INTEGER		
14325	LB	INTEGER			14326	LC	INTEGER		
14314	LINE	INTEGER			50	LTITLE	INTEGER	ARRAY	TITLES
14312	MAX	INTEGER			14311	MIN	INTEGER		
14313	MSW	INTEGER			14335	MTEST	INTEGER	ARRAY	
15370	MVAR	INTEGER	ARRAY		14276	NA	INTEGER		
15403	NFORM	INTEGER	ARRAY		4	NP	INTEGER		INDICE
14347	NPX	INTEGER	ARRAY		14307	NS	INTEGER		
14323	NT	INTEGER			200	NTITLE	INTEGER		TITLES
14301	TEMPX	REAL			0	XOB	REAL	ARRAY	VARBLS
12574	XRT	REAL	ARRAY	VARBLS	14404	XSORT	REAL	ARRAY	

FILE NAMES		MODE							
0	INPUT	MIXED	4102	OUTA	6143	OUTB	10204	OUTD	
2041	OUTPUT	FMT	4102	TAPE5	6143	TAPE6	10204	TAPE7	

EXTERNALS	TYPE	ARGS			
EOF	REAL	1	EXIT	0	
PRESRT		3	REGCOR	4	
VARTRN		4			

INLINE FUNCTIONS	TYPE	ARGS	
SHIFT	NO TYPE	2	INTRIN

STATEMENT LABELS

13237	10	FMT	0	20	13252	30	FMT				
12277	35		13257	37	FMT	13276	39	FMT			
13315	41	FMT	12320	43		13327	45	FMT			
12323	46		13354	49	FMT	0	51		INACTIVE		
13365	53	FMT	0	55		13377	57	FMT			
13407	58	FMT	12363	59		13415	60	FMT			

STATEMENT LABELS

13431	65	FMT	13453	67	FMT		13460	70	FMT		
12430	75		0	80		INACTIVE	13476	85	FMT		
13502	90	FMT	12442	95			12463	100			
13524	102	FMT	0	103			12502	104			
13547	105	FMT	12505	110			13560	115	FMT		
13577	120	FMT	12527	125			13613	130	FMT		
12533	135		13624	140	FMT		0	141		INACTIVE	
13636	145	FMT	12546	146			13643	147	FMT		
12563	149		13660	151	FMT		12573	153			
13674	155	FMT	0	156		INACTIVE	13707	157	FMT		
12606	158		12613	160			13714	165	FMT		
12626	167		13731	169	FMT		12632	181			
0	182		0	183			0	184			
12657	185		0	190			12674	200			
13745	210	FMT	12703	220			12712	221			
13766	222	FMT	13777	223	FMT		12736	224			
14007	225	FMT	0	226			12763	248			
14014	249	FMT	0	250		INACTIVE	14040	260	FMT		
12776	270		14057	280	FMT		13003	290			
14073	300	FMT	14104	310	FMT		13014	320			
13016	330		13026	340			13032	350			
0	360		13040	370			13053	380			
14116	390	FMT	13057	395			0	400			
13102	420		13111	430			14134	435	FMT		
14147	440	FMT	14154	445	FMT		0	450			
14165	455	FMT	13156	460			14177	470	FMT		
14220	480	FMT	13171	490			14233	500	FMT		
13173	510		0	1000		INACTIVE	14245	1010	FMT		
13201	1020		14255	1030	FMT		13203	2000			

COMMON BLOCKS	LENGTH
VARBLS	11000
TITLES	129
INDICE	8
KEYS	55

STATISTICS

PROGRAM LENGTH	31468	1638
BUFFER LENGTH	122458	5285
CM LABELED COMMON LENGTH	256708	11192

```
      SUBROUTINE VARTRN(KA,NUM,KTRAN,EXPP)
      COMMON/VARBLS/ XOB(11,500), XRT(11,500)
      DATA(PI=3.14159265358979)
      LC=KTRAN+1
      GO TO (10,30,40,50,70,90,110,2000,2000,2000,2000),LC
   10 DO 20 K=1,NUM
      XRT(KA,K)=XOB(KA,K)
   20 CONTINUE
      GO TO 2000
   30 DO 35 K=1,NUM
      XRT(KA,K)=0.0 $ IF(XOB(KA,K).GT.0.0) XRT(KA,K)=ALOG10(XOB(KA,K))
   35 CONTINUE
      GO TO 2000
   40 DO 45 K=1,NUM
      XRT(KA,K)=0.0 $ IF(XOB(KA,K).GT.0.0) XRT(KA,K)=ALOG(XOB(KA,K))
   45 CONTINUE
      GO TO 2000
   50 DO 60 K=1,NUM
      XRT(KA,K)=0.0
      IF(XOB(KA,K).GT.0.0) XRT(KA,K)=SQRT(XOB(KA,K))
   60 CONTINUE
      GO TO 2000
   70 DO 80 K=1,NUM
      XRT(KA,K)=0.0
      IF(XOB(KA,K).GT.0.0) XRT(KA,K)=XOB(KA,K)**EXPP
   80 CONTINUE
      GO TO 2000
   90 DO 100 K=1,NUM
      XRT(KA,K)=SIN(XOB(KA,K))
  100 CONTINUE
      GO TO 2000
  110 DO 120 K=1,NUM
      XRT(KA,K)=COS(XOB(KA,K))
  120 CONTINUE
 2000 RETURN
      END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 VARTRN

VARIABLES	SN	TYPE	RELOCATION						
0	EXPP	REAL	F.P.	154	K	INTEGER			
0	KA	INTEGER	F.P.	0	KTRAN	INTEGER		F.P.	
153	LC	INTEGER		0	NUM	INTEGER		F.P.	
152	PI	REAL		0	XOB	REAL	ARRAY	VARBLS	
12574	XRT	REAL	ARRAY VARBLS						

EXTERNALS	TYPE	ARGS				
ALOG	REAL	1 LIBRARY	ALOG10	REAL	1 LIBRARY	
COS	REAL	1 LIBRARY	SIN	REAL	1 LIBRARY	
SQRT	REAL	1 LIBRARY				

STATEMENT LABELS

26	10	0	20	35	30		
0	35	53	40	0	45		
71	50	0	60	107	70		
0	80	126	90	0	100		
140	110	0	120	151	2000		

COMMON BLOCKS	LENGTH
VARBLS	11000

STATISTICS

PROGRAM LENGTH	1558	109
CM LABELED COMMON LENGTH	253708	11000

```
      SUBROUTINE PRESRT(YB,N,KEY)
      DIMENSION YB (N)
      COMPA = 0.0
      COMPB = 0.0
 5    COMPC = 0.0
      COMPA = N
      COMPB = COMPA * 5.E-1
      IF ( COMPB . LE. 0.0 )  GO TO 100
      COMPC = SQRT ( COMPB )
10    JB = COMPC
      KB = N / JB
      IF ( MOD (N, KB ) . EQ. 0 )  GO TO 10
      KB = KB + 1
      NTOT = KB * JB
15    NP1 = N + 1
C**** SET KEY FOR RANKING
      RP=1.E18
      DO 5 K = NP1 , NTOT
      YB (K) = RP
20    5 CONTINUE
     10 CALL SORT ( YB, JB, KB, YB, N,KEY )
      RETURN
    100 PRINT 110
    110 FORMAT ( 8X, 39HSORRY NO SORT DUE TO BAD INDICE BREAKUP  )
25    CALL EXIT
      END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 PRESRT

VARIABLES	SN	TYPE	RELOCATION						
72	COMPA	REAL			73	COMPB	REAL		
74	COMPC	REAL			75	JB	INTEGER		
102	K	INTEGER			76	KB	INTEGER		
0	KEY	INTEGER	F.P.		0	N	INTEGER		F.P.
100	NP1	INTEGER			77	NTOT	INTEGER		
101	RP	REAL			0	YB	REAL	ARRAY	F.P.

FILE NAMES	MODE
OUTPUT	FMT

EXTERNALS	TYPE	ARGS				
EXIT		0		SORT		6
SQRT	REAL	1	LIBRARY			

INLINE FUNCTIONS	TYPE	ARGS	
MOD	INTEGER	2	INTRIN

STATEMENT LABELS
0 5 34 10 44 100
62 110 FMT

STATISTICS
PROGRAM LENGTH 103B 67

```
      SUBROUTINE SORT(ARRAY,JB,KB,Y,LLIM,KEY)
      DIMENSION ARRAY(JB,KB)
      DIMENSION YMIN(200),KPOS(200)
      DIMENSION Y(LLIM),Z(500)
C****  SET KEY FOR RANKING
      ISW=0 $ IF(KEY.EQ.10110710B) ISW=1
C
C
C FILL YMIN WITH THE MINIMUM VALUE FROM EACH COLUMN.  SAVE THE ROW POSIT
      DO 60 K=1,KB
      COLMIN = ARRAY(1,K
      JPOS = 1
      DO 50 J=1,JB
      IF (ARRAY(J,K) .GE. COLMIN) GO TO 50
      COLMIN = ARRAY(J,K)
      JPOS = J
   50 CONTINUE
      YMIN(K) = COLMIN
      KPOS(K) = JPOS
   60 CONTINUE
C
C
C FOR EACH POSITION IN THE ARRAY--
      DO 300 KCOL = 1,KB
      DO 300 KROW = 1,JB
C
C
C FIND MINIMUM VALUE OF YMIN, AND THE COLUMN AND ROW FROM WHICH IT CAME.
      YLIT = YMIN(KCOL)
      LCOL = KCOL
      DO 100 K=KCOL,KB
      IF (YMIN(K) .GE. YLIT) GO TO 100
      YLIT = YMIN(K)
      LCOL = K
  100 CONTINUE
      LROW = KPOS(LCOL)
C
C
C FILL POSITION FROM WHICH IT CAME WITH VALUE IN SLOT WHERE IT IS GOING.
      ARRAY(LROW,LCOL) = ARRAY(KROW,KCOL)
C
C
C STORE THE MINIMUM VALUE OF YMIN IN THE NEXT POSITION IN THE SORTED SEQ
      ARRAY(KROW,KCOL) = YLIT
C
C
C DETERMINE THE NEW MINIMUM OF THE COLUMN FROM WHICH THE LAST MINIMUM WA
C   TAKEN (IF IT IS DIFFERENT FROM THE ONE IN WHICH IT WAS PLACED), AND
C   IT IN THE CORRESPONDING POSITION OF YMIN.
      IF (KCOL .EQ. LCOL) GO TO 200
      COLMIN = ARRAY(1,LCOL)
      JPOS = 1
      DO 150 J=1,JB
      IF (ARRAY(J,LCOL) .GE. COLMIN) GO TO 150
      COLMIN = ARRAY(J,LCOL)
      JPOS = J
  150 CONTINUE
```

```
                YMIN(LCOL) = COLMIN
                KPOS(LCOL) = JPOS
      60      C
              C
              C IF THE LAST MINIMUM CAME FROM THE COLUMN INTO WHICH IT WAS SORTED, OR
              C   IF THE LAST SORTED VALUE REPLACED THE MINIMUM OF THE COLUMN IN WHICH
              C   PLACED, FOR THE BALANCE(IF ANY) OF THAT COLUMN FIND THE NEW MINIMUM,
      65      C   AND PLACE IT IN THE CORRESPONDING POSITION IN YMIN.
                200 IF (KROW .EQ. JB) GO TO 300
                    IF (LCOL .EQ. KCOL) GO TO 250
                    IF (KROW .NE. KPOS(KCOL)) GO TO 300
                250 J1 = KROW + 1
      70            COLMIN = ARRAY(J1,KCOL)
                    JPOS = J1
                    DO 260 J=J1,JB
                    IF (ARRAY(J,KCOL) .GE. COLMIN) GO TO 260
                    COLMIN = ARRAY(J,KCOL)
      75            JPOS = J
                260 CONTINUE
                    YMIN(KCOL) = COLMIN
                    KPOS(KCOL) = JPOS
                300 CONTINUE
      80            MRS=0
                    IF(ISW.EQ.0) GO TO 450
              C**** RESET ARRAY FOR DESCENDING ORDER
                    NG=LLIM
                    DO 350 K=1,LLIM
      85            Z(NG)=Y(K)
                    NG=NG-1
                350 CONTINUE
                    DO 400 K=1,LLIM
                    Y(K)=Z(K)
      90        400 CONTINUE
                450 IF(MRS.NE.0)  GO TO 2000
              C**** LIST THE SORTED ARRAY
                    PRINT 500,Y
                500 FORMAT(1X,5F12.4/(1X,5F12.4))
      95        2000 RETURN
                    END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 SORT

VARIABLES	SN	TYPE	RELOCATION						
0	ARRAY	REAL	ARRAY	F.P.	221	COLMIN	REAL		
217	ISW	INTEGER			223	J	INTEGER		
0	JB	INTEGER		F.P.	222	JPOS	INTEGER		
231	J1	INTEGER			220	K	INTEGER		
0	KB	INTEGER		F.P.	224	KCOL	INTEGER		
0	KEY	INTEGER		F.P.	544	KPOS	INTEGER	ARRAY	
225	KROW	INTEGER			227	LCOL	INTEGER		
0	LLIM	INTEGER		F.P.	230	LROW	INTEGER		
232	MRS	INTEGER			233	NG	INTEGER		
0	Y	REAL	ARRAY	F.P.	226	YLIT	REAL		
234	YMIN	REAL	ARRAY		1054	Z	REAL	ARRAY	

FILE NAMES	MODE
OUTPUT	FMT

STATEMENT LABELS

41	50	0	60		64	100		
110	150	115	200		123	250		
141	260	146	300		0	350		
0	400	173	450		212	500	FMT	
202	2000							

STATISTICS
PROGRAM LENGTH 20708 1080

```
      SUBROUTINE REGCOR(KVAR,FLEVEN,FLEVRE,MVAR)
      DIMENSION Y(500),SX(11),SY(11),A(11,11), STDERC(11)
      COMMON/VARBLS/XOB(11,500),XRT(11,500)
      COMMON/TITLES/KTITLE(5,8),LTITLE(11,8),NTITLE
      COMMON/INCICE/KCONT,KNUM,IDY,FLEVEL,NP,CIT,COT,IXR
      COMMON/KEYS/IRANK(11),ITRANS(11),EXPO(11),KSORT(11),KRANK(11)
      DIMENSION C(11, 11), CY(11), R(11, 11), RY(11), KFA(11), STUDT(11)
     A  ,FLEV(11),STDEV(11),KOUT(11),PARFL(11)
      DIMENSION SUMS(11),MEANS(11),X(11,500),KSETS(11),IFORM(2),
     1  TEMP(10,10),TEMPA(11),V4(11),KIN(11),B(21,21),D(21,21),
     2  REGCOF(11),STDREG(11),MVAR(11),KEX(11)
      REAL MEANS
      INTEGER CIT, COT
      DATA(IFORM(1)=20H
      DO 1 J=1,11
      KSETS(J)=0
      KEX(J)=0
      DO 1 K=1,500
      X(J,K)=0.0
    1 CONTINUE
      DO 2 K=1,500
      Y(K)=0.0
    2 CONTINUE
      JAY=MVAR(KVAR)
      ISW=0
      FMIN=0
      KMIN=0
      KAX=0
      IMW=0
      NSTEP=0
      PRINT 73
      READ 74,ITEST
      IF(ITEST.EQ.3RYES) ISW=1
      DO 3 K=1,NP
      Y(K)=XRT(JAY,K)
    3 CONTINUE
      NA=0
      YEXP=EXPO(JAY) $ IF(YEXP.EQ.0.0) YEXP=1.0 $ KYTRAN=ITRANS(JAY)
      DO 4 K=1,11
      IF(ITRANS(K).NE.5RPOW      ) GO TO 4
      KA=K  $ GO TO 7
    4 CONTINUE
      DO 6 I=1,11
      IF(KRANK(I).EQ.0)  GO TO 6
      IF(KRANK(I).EQ.JAY) GO TO 6
      J=KRANK(I) $ NA=NA+1 $ KSETS(NA)=J
      DO 5 K=1,NP
      X(NA,K)=XRT(J,K)
    5 CONTINUE
    6 CONTINUE
      GO TO 9
    7 MAX=EXPO(KA) $ KAX=MVAR(KA)
      DO 8 JA=1,MAX
      NA=JA $ KSETS(JA)=NA
      DO 8 JB=1,NP
      X(JA,JB)=XOB(KA,JB)**JA
    8 CONTINUE
```

```
      9  NX=KNUM=NA $ M=0
         IF(NX.LT.1) GO TO 1000
60        DO 11 J = 1, 11
          SX(J) = 0.0
          SY(J) = 0.0
          CY(J) = 0.0
          KFA(J) = 0.0
65        STUDT(J) = 0.0
          FLEV(J) = 0.0
          STDEV(J) = 0.0
          RY(J) = 0.0
         V4(J)=0.0
70       KIN(J)=0
         SUMS (J) = 0.0
         MEANS (J) = 0.0
          DO 11 K = 1, 11
          A(J, K) = 0.0
75        C(J, K) = 0.0
          R(J, K) = 0.0
         B(J,K)=0.0
         D(J,K)=0.0
     11   CONTINUE
80       DO 12 J = 1, NX
         DO 12 K = 1, NP
         SUMS (J) = SUMS (J) + X(J,K)
     12  CONTINUE
         DENOM = NP
85       DO 13 J = 1, NX
         MEANS (J) = SUMS (J) / DENOM
     13  CONTINUE
         SUMY = 0.0
         DO 14 K = 1, NP
90       SUMY = SUMY + Y (K)
     14  CONTINUE
         YMEAN = 0.0
         YMEAN = SUMY / DENOM
          MARK = 0
95        MT = M
          EXPVAR = 0.0
          IF (M.GT.1) GO TO 15
          MT = NX
          GO TO 15
100  15   NQ = NP - 1
C**** WHEN MRS = 1 UNBIASED ESTIMATORS I.E. USE (N-1 )
C**** WHEN MRS.NE. 1 - BIASED ESTIMATORS I.E. USE (N)
      MRS = 1
      BIAS = DENOM
105   IF ( MRS. EQ. 1 ) BIAS = DENOM - 1.0
C
C  ******  NO. OF COEFFICIENTS DESIRED CANNOT EXCEED OBSERVATIONS
C
       IF (NQ.LT.MT) MT = NQ
110    M1 = MT + 1
       M2 = 2 * MT + 1
       SY2 = 0.0
      MAX=M1+MT
      DO 16 JA=1,MAX
```

```
115               DO 16 JB=1,MAX
                  B(JA,JB)=0.0 $ D(JA,JB)=0.0
                16 CONTINUE
              C**** IN MATRIX OPERATION JA=ROW AND JB=COLUMN
                  MIN=M1+1
120               DO 17 JA=MIN,MAX
                  DO 17 JB=1,MT
                  JC=JB+M1
                  IF(JA.NE.JC) GO TO 17
                  B(JA,JB)=-1.0
125             17 CONTINUE
                  MIN=M1+1
                  DO 18 JA=1,MT
                  JC=JA+M1
                  DO 18 JB=MIN,MAX
130               IF(JC.NE.JB)  GO TO 18
                  B(JA,JB)=1.0
                18 CONTINUE
              C
              C  ******  FORM *A* MATRIX FOR INDEPENDENT VARIABLE AND *SY* COLUMN
135           C  ******  MATRIX FOR DEPENDENT VARIABLE
              C  ******  LET  K = ROW  AND  L = COLUMN
              C
                    DO 35 J = 1, NP
                    LA = 1
140                 MIN = 0
                    CONC = 1.0
                    CONB = 1.0
                    IF (M.EQ.0) CONB = X(LA, J)
                    SY2 = SY2 + Y(J) * Y(J)
145                 DO 35 K = 1, M1
                    SY(K) = SY(K) + Y(J) * CONC
                    MIN = MIN + 1
                    DO 25 L = MIN, M1
                    A(K, L) = A(K, L) + CONB * CONC
150                 A(L, K) = A(K, L)
                    IF (M.EQ.0) GO TO 20
                    CONC = CONC * X(LA, J)
                    GO TO 25
                20  LA = L
155                 CONB = X(LA, J)
                25  CONTINUE
                    IF (M.EQ.0) GO TO 30
                    CONB = CONB * X(LA, J)
                    CONC = CONB
160                 GO TO 35
                30  LA = K
                    CONC = X(LA, J)
                    CONB = CONC
                35  CONTINUE
165                 A(1, 1) = NP
                    NV = 1
              C
              C  ******  COMPUTATION OF COVARIANCE , INITIAL STANDARD ERROR , AND
              C  ******  STANDARD DEVIATION OF DEPENDENT VARIABLE
170           C
                    CYY = SY2 - SY(1) * SY(1) / DENOM
```

```
      STDY = SQRT(CYY / DENOM / (DENOM - 1.0))
      STDEVY = SQRT(CYY / BIAS )
C
C  ******  FORM *C* MATRIX , COVARIANCE , AND *CY* COLUMN MATRIX
C  ******  LET  K = ROW  AND  L = COLUMN
C
 40   DO 45 K = 1, MT
      CY(K) = SY(K + 1) - A(1, K + 1) * SY(1) / DENOM
      DO 45 L = K, MT
      C(K, L) = A(K + 1, L + 1) - A(1, K + 1) * A(1, L + 1) / DENOM
      C(L, K) = C(K, L)
 45   CONTINUE
      DO 50 K=1,M1
      C(K,M1)=CY(K)
 50   CONTINUE
      C(M1,M1)=CYY
      DEGF = NP - NV - 1
C
C  ******  FORM *R* MATRIX , *RY* COLUMN MATRIX , CORRELATION COEFF.
C  ******  LET  K = ROW  AND  L = COLUMN
C
      DO 57 K = 1, MT
      B(K,K)=R(K,K)=1.0
      C2 = C(K, K) * CYY
      IF (C2.LE.0.0) GO TO 1060
C
C  ******  STANDARD DEVIATION OF COMPUTED INDEPENDENT VARIABLE
C****  AND SET B MATRIX ON THE FIRST PASS ONLY
C
      STDEV(K) = SQRT(C(K, K)/ BIAS )
      RY(K)=CY(K)/SQRT(C2) $ IF(MARK.EQ.0)B(K,M1)=RY(K)
      IF (K.EQ.MT) GO TO 57
      MIN = K + 1
      DO 55 L = MIN, MT
      C2 = C(K, K) * C(L, L)
      IF (C2.LE.0.0) GO TO 1060
      R(L,K)=R(K,L)=C(K,L)/SQRT(C2) $ IF(MARK.EQ.0)B(L,K)=B(K,L)=R(K,L)
 55   CONTINUE
 56   KZ = K
 57   CONTINUE
      B(M1,M1)=1.0
      DO 58 K=1,MT
      B(M1,K)=B(K,M1)
 58   CONTINUE
 73   FORMAT(2X*DO YOU WANT TO LIST INTERMEDIATE MATRICES*
     1  /2X*TYPE YES OR NO*)
 74   FORMAT(R3)
      IF(ISW.EQ.0) GO TO 400
C****  LIST A MATRIX - RAW SUM OF SQUARES AND CROSS PRODUCTS
      WRITE(COT,86)
 86   FORMAT(1H1,///1X*RAW SUMS OF SQUARES AND PRODUCTS-OR (A) MATRIX*)
 85   DO 90 LA=1,M1
      TEMPA(LA)=SY(LA)
      DO 90 LB=1,M1
      TEMP(LA,LB)=A(LA,LB)
 90   CONTINUE
      MATE=0
```

```
                ASSIGN 91 TO ISX $ MAX=M1 $ GO TO 300
230          91 MAX=M1
                DO 92 J=1,M1
                DO 92 K=1,M1
                TEMP(J,K)=C(J,K)
             92 CONTINUE
235          C**** LIST COVARIANCE MATRIX
                WRITE(COT,93)
             93 FORMAT( ///1X*COVARIANCE MATRIX OR (C) MATRIX*)
                MATE=1 $ ASSIGN 94 TO ISX $ GO TO 300
             C**** LIST R MATRIX SIMPLE COEFFICIENTS OF REGRESSION(INITIAL B MATRIX)
240          94 MAX=M1
                WRITE(COT,97)
             97 FORMAT(///1X*R MATRIX SIMPLE COEFFICIENTS OF REGRESSION*
               1  /1X*INITIAL B MATRIX*//)
                DO 98 J=1,MAX
245             DO 98 K=1,MAX
                TEMP(J,K)=B(J,K)
             98 CONTINUE
                MATE=1 $ ASSIGN 400 TO ISX $ GO TO 300
            150 PRINT 160
250         160 FORMAT(2X*YOUR JOB WENT TO COMPLETION*)
                GO TO 2000
            200 FORMAT(2X*DO YOU WANT RESIDUALS LISTED FOR STEP*I4* -YES OR NO*)
            300 AMAX=-1.0E18
                DO 310 JA=1,MAX
255             DO 310 JB=1,MAX
                IF(TEMP(JA,JB).GT.AMAX) AMAX=TEMP(JA,JB)
            310 CONTINUE
                IF(AMAX.GT.1.0)  GO TO 320
                IF0=6RF10.6)  $ GO TO 340
260         320 IF(AMAX.GT.1.0E4)  GO TO 330
                IF0=6RF10.3)  $ GO TO 340
            330 IF(AMAX.GT.1.0E6) GO TO 335
                IF0=6RF10.1    $ GO TO 340
            335 IF0=6RE10.4
265         340 MIN=1
                DO 360 JA=1,MAX
                IXX=((MIN-1)*10)+1 $ IXY=MAX-MIN+2
                ENCODE(13,350,IFORM)IXX,IXY,IF0
            350 FORMAT(*(*I2*X,*I2,R6)
270             IF(MATE.EQ.1) GO TO 355
                WRITE(COT,IFORM)(TEMP(JA,JB),JB=MIN,MAX),TEMPA(JA)
                GO TO 358
            355 WRITE(COT,IFORM)(TEMP(JA,JB),JB=MIN,MAX)
            358 MIN=MIN+1
275         360 CONTINUE
                GO TO ISX(91,94,400,700)
             C**** INTERCHANGE THE B AND D MATRICES
            400 MAX=M1+MT
                DO 410 JA=1,MAX
280             DO 410 JB=1,MAX
                D(JA,JB)=B(JA,JB)
            410 CONTINUE
                IF(IMW.NE.0) GO TO 420
                DO 415 JA=1,MT
285             KJO=JA $ KFA(JA)=JA $ KOUT(KJO)=JA
```

```
      415  CONTINUE
      420  KMAX=0 $ VMAX=-1.0E18 $ ITDEG=NP-1-NSTEP $ DEGF=IDEG=ITDEG-1
           DO 430 JA=1,MT
           KN=KOUT(JA) $ IF(KN.LT.0) GO TO 430
290        V4(KN)=B(KN,M1)*B(KN,M1)/B(KN,KN)
           FLEV(KN)=(V4(KN)*DEGF)/(B(M1,M1)-V4(KN))
           STUDT(KN)=SQRT(FLEV(KN)) $ IF(V4(KN).LT.VMAX) GO TO 430
           VMAX=V4(KN) $ KMAX=KN
      430  CONTINUE
295        FMAX=FLEV(KMAX)
           IF(IMW.NE.0) GO TO 541
           WRITE(COT,435)
      435  FORMAT(1H1,///1X*INITIAL REGRESSION INFORMATION*//)
           IF(KAX.EQ.0) GO TO 440
300        WRITE(COT,437)KAX
      437  FORMAT(1X*THIS IS A POWER SERIES ANALYSIS FOR VARIABLE *
          1 I4/1X*VARIABLES AS LISTED ARE DEGREES OF POLYNOMIAL*/)
      440  WRITE(COT,450)
           WRITE(COT,460)(KSETS(K),FLEV(K),STUDT(K),STDEV(K),MEANS(K),K=1,MT)
305   450  FORMAT(///1X*VARIABLE*8X*INITIAL*4X*STUDENT'S T*7X*STANDARD*
          1 7X*VARIABLE*/2X*NUMBER*9X*F-LEVEL*21X*DEVIATION*9X*MEAN*/)
      460  FORMAT((4X,I3,2X,4(2X,F13.6)))
           WRITE(COT,470)STDEVY, YMEAN,SUMY
      470  FORMAT(//1X*STANDARD ERROR OF Y = *F13.6,10X*MEAN OF Y = *F13.6
310       1  //1X*SUM OF Y = *F13.6)
           IF(FLEVEN.NE.0.0) GO TO 475
           KIN(1)=KN=KFA(1)$FMAX=FLEV(KN) $ KMAX=KN $ GO TO 541
      475  KIN(1)=KN=KMAX
           IF(FMAX.GE.FLEVEN) GO TO 541
315        WRITE(COT,500) FMAX
      500  FORMAT(1X*ALL INDEPENDENT VARIABLES FAIL F LEVEL TEST TO*
          1 *ENTER REGRESSION F LEVEL MAX = *F13.6/2X*JOB IS ABORTED*)
           CALL EXIT
      541  IF(IMW.NE.0) GO TO 542
320        IMW=1 $ GO TO 400
      542  NSTEP=NSTEP+1 $ IF(NSTEP.GT.MT) GO TO 150
           KJO=0 $ KJI=NSTEP $ IF(FLEVEN.EQ.0.0)KMAX=KFA(NSTEP)
           FMAX=FLEV(KMAX) $ KIN(NSTEP)=KMAX $ IF(KMAX.EQ.KMIN) GO TO 1100
           IF(FLEVEN.EQ.0.0) GO TO 543
325        IF(FMAX.LT.FLEVEN) GO TO 1080
      543  DO 545 JA=1,KJI
           KN=KIN(JA)
           DO 544 JB=1,MT
           IF(KOUT(JB).LT.0) GO TO 544
330        IF(KN.EQ.JB) KOUT(JB)=-1
      544  CONTINUE
      545  CONTINUE
            DO 547 JA=1,MT
      547  CONTINUE
335        KJI=NSTEP
           KN=MJA=MJB=KIN(NSTEP) $ KZ=KN
     C****  COMPUTE B MATRIX FOR THIS STEP
      548  MAX=M1+MT
           DO 555 JA=1,MAX
340        DO 553 JB=1,MAX
           IF(D(MJA,MJB).EQ.0.0) GO TO 1040
           IF(JA.NE.KN)  GO TO 551
```

```
      B(JA,JB)=D(JA,JB)/D(MJA,MJB)
      GO TO 553
  551 B(JA,JB)=D(JA,JB)-(D(JA,KZ)*D(KZ,JB)/D(MJA,MJB))
  553 CONTINUE
  555 CONTINUE
      IF(MJB.NE.MAX) GO TO 558
      DO 556 JA=1,MAX
      IF(JA.EQ.KN) GO TO 556
      B(JA,KN)=D(JA,KN)-(D(JA,MJB)/D(MJA,MJB))
  556 CONTINUE
  558 ORGVAR=C(M1,M1) $ PEREXP=(1.0-B(M1,M1))*1.0E2
      PERUNE=B(M1,M1)*1.0E2 $ RESQR=C(M1,M1)*B(M1,M1)
      STDRES=SQRT(RESQR/DEGF) $ CONST=0.0 $ RMULT=SQRT(1.-B(M1,M1))
      DO 570 JA=1,KJI
      KN=KIN(JA)    $ REGCOF(KN)=B(KN,M1)*SQRT(C(M1,M1)/C(KN,KN))
      MZ=M1+KN
      STDREG(KN)=STDRES*SQRT(B(MZ,MZ)/C(KN,KN))
      CONST=CONST+REGCOF(KN)*MEANS(KN)
      PARFL(KN)=(DEGF*B(KN,M1)*B(KN,M1))/(B(M1,M1)*B(MZ,MZ))
  570 CONTINUE
      CONST=YMEAN-CONST
      IF(ISW.EQ.0) GO TO 700
  700 WRITE(COT,710)NSTEP
  710 FORMAT(1H1,////1X*REGRESSION INFORMATION FOR STEP NO. *I4//)
      WRITE(COT,715)KSETS(KMAX),FMAX
  715 FORMAT(1X*VARIABLE ENTERING REGRESSION THIS STEP IS X(*
     1  I2*)*5X*F LEVEL TO ENTER =*F13.6/)
      WRITE(COT,720)ORGVAR,PEREXP,PERUNE,RMULT,RESQR,STDRES,NSTEP,IDEG,
     1  CONST
  720 FORMAT(1X*ORIGINAL VARIANCE*21X,F12.4
     1  /1X*PERCENT EXPLAINED VARIANCE*15X,F9.4
     2  /1X*PERCENT UNEXPLAINED VARIANCE*13X,F9.4
     A  /1X*MULTIPLE CORRELATION COEFF*12X,F12.4
     3  /1X*RESIDUAL SUM OF SQUARES*15X,F12.4
     4  /1X*STANDARD ERROR OF RESIDUALS*11X,F12.4
     5  /1X*DEGREES OF FREEDOM OF REGRESSION*14X,I4
     6  /1X*DEGREES OF FREEDOM OF RESIDUALS*15X,I4
     7  /1X*CONSTANT*30X,F12.4/)
      WRITE(COT,725)
  725 FORMAT(1X*VARIABLE*4X*REGRESSION*7X*STANDARD*6X*PARTIAL*
     1  /12X*COEFFICIENTS*8X*ERROR*9X*F VALUE*/)
      DO 727 JA=1,KJI
      KN=KIN(JA) $ KO=KSETS(KN)
      WRITE(COT,726)KO,REGCOF(KN),STDREG(KN),PARFL(KN)
  726 FORMAT(3X,I3,4X,F13.6,2(2X,F13.6))
  727 CONTINUE
      DIFF2=0.0  $ AEXP=1.0/YEXP
      PRINT 200,NSTEP
      READ 74,ITEST
      IF(ITEST.NE.3RYES) GO TO 932
      LINE=0
      DO 920 J=1,NP
      IF(LINE.NE.0) GO TO 900
      WRITE(COT,860) NSTEP
  860 FORMAT(1H1,///1X*LIST OF RESIDUALS FOR STEP NUMBER *I3//)
      DO 880 JA=1,NTITLE
      WRITE(COT,870)(KTITLE(JA,JB),JB=1,8)
```

```
400          870  FORMAT(1X,7A10,A9)
             880  CONTINUE
                  WRITE(COT,890)
             890  FORMAT(//1X*OBS. NO. OBSERVED VALUE  PREDICTED VALUE*
                 1  6X*DEVIATION*/)
405          900  FOFX=0.0
                  DO 903  JB=1,KJI
                  KN=KIN(JB) $ FOFX=FOFX+(REGCOF(KN)*X(KN,J))
             903  CONTINUE
                  YCOMP=FOFX+CONST $ YOBS=Y(J) $ ITEST=KYTRAN
410               IF(ITEST.EQ.5ROUT    ) GO TO 905
                  IF(ITEST.EQ.5RSIN    ) GO TO 905
                  IF(ITEST.EQ.5RCOS    ) GO TO 905
                  YOBS=XOB(JAY,J)
                  IF(ITEST.EQ.5RLOG10  ) YCOMP=10.0**YCOMP
415               IF(ITEST.EQ.5RLOGE   ) YCOMP=EXP(YCOMP)
                  IF(ITEST.EQ.5RSQRT   ) YCOMP=YCOMP*YCOMP
                  IF(ITEST.EQ.5REXP    ) YCOMP=YCOMP**AEXP
             905  DIFF=YOBS-YCOMP $ DIFF2=DIFF2+(DIFF*DIFF)
                  WRITE(COT,910)J,YOBS,YCOMP,DIFF
420          910  FORMAT(1X,I3,5X,F13.6,4X,F13.6,2X,F13.6)
                  LINE=LINE+1 $ IF(LINE.GT.50) LINE=0
             920  CONTINUE
                  WRITE(COT,930)DIFF2
             930  FORMAT(//1X*SUM OF DEVIATIONS SQUARED = *F20.6)
425          932  IF(FLEVRE.EQ.0.0) GO TO 400
                  DO 935 JA=1,KJI
                  KN=KIN(JA)
                  IF(PARFL(KN).LT.FLEVRE) GO TO 940
             935  CONTINUE
430               GO TO 400
             940  KMIN=KN $ FMIN=PARFL(KMIN) $ NSTEP=NSTEP-1
                  WRITE(COT,945)KSETS(KMIN),FMIN,FLEVRE
             945  FORMAT(//1X*VARIABLE WITH INDEX = *I4* HAS BEEN *
                 1  *EXCLUDED FROM REGRESSION WITH F LEVEL = *F15.6
435              2  /1X*WHERE F LEVEL TO EXCLUDE = *F15.6)
                  JB=0
                  DO 950 JA=1,KJI
                  KN=KIN(JA)
                  IF(KN.EQ.KMIN)  GO TO 950
440               JB=JB+1 $ KEX(JB)=KN
             950  CONTINUE
                  KJI=KJI-1
                  DO 955 JA=1,KJI
                  KIN(JA)=KEX(JA)
445          955  CONTINUE
                  DO 960 JA=1,MT
                  KN=KOUT(JA)
                  IF(KN.GE.0) GO TO 960
                  KOUT(JA)=KMIN
450               GO TO 965
             960  CONTINUE
             965  KN=KMIN $ MJA=KN+M1 $ MJB=M1+MT $ KZ=MJB
                  ITDEG=NP-1-NSTEP $ DEGF=IDEG=ITDEG
                  DO 970 JA=1,MJB
455               DO 970 JB=1,MJB
                  D(JA,JB)=B(JA,JB)
```

```
             970  CONTINUE
                  GO TO 548
            1000  PRINT 1010
460         1010  FORMAT(2X*ERROR IN NUMBER OF INDEPENDENT VARIABLES*)
                  CALL EXIT
            1040  PRINT 1050
            1050  FORMAT(1X*DIAGONAL ELEMENT IS ZERO-JOB ABORTED*)
                  CALL EXIT
465         1060  PRINT 1070
            1070  FORMAT(2X*C2 IS LESS THAN OR EQUAL ZERO--ABORTED*)
                  CALL EXIT
            1080  WRITE(COT,1090)KSETS(KMAX),FMAX,FLEVEN
            1090  FORMAT(1H1,///1X*VARIABLE WITH INDEX = *I4* HAD A F LEVEL*
470              1  * TO ENTER = *F15.6/1X*WHICH IS LESS THAN ENTRY F LEVEL*
                 2  * OF *F15.6* ALL OTHER VARIABLES NOT IN REGRESSION ARE*
                 3 * IGNORED*//)
                  GO TO 150
            1100  WRITE(COT,1110)KSETS(KMAX)
475         1110  FORMAT(1H1,///1X*VARIABLE WITH INDEX = *I4* PREVIOUSLY*
                 1  * EXCLUDED*)
                  GO TO 150
            2000  RETURN
                  END
```

43 CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

364 I 700 THIS IF DEGENERATES INTO A SIMPLE TRANSFER TO THE LABEL INDICATED.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 REGCOR

VARIABLES	SN	TYPE		RELOCATION
3614	A	REAL	ARRAY	
2544	AMAX	REAL		
2520	BIAS	REAL		
5	CIT	INTEGER		INDICE
2527	CONC	REAL		
6	COT	INTEGER		INDICE
2533	CYY	REAL		
20467	D	REAL	ARRAY	
2510	DENOM	REAL		
2573	DIFF2	REAL		
2515	EXPVAR	REAL		
3	FLEVEL	REAL		INDICE
0	FLEVRE	REAL		F.P.
2470	FMIN	REAL		
2502	I	INTEGER		
2	IDY	INTEGER		INDICE
2545	IFO	INTEGER		
0	IRANK	INTEGER	ARRAY	KEYS
2543	ISX	INTEGER		
2475	ITEST	INTEGER		
7	IXR	INTEGER		INDICE
2547	IXY	INTEGER		
2504	JA	INTEGER		
2505	JB	INTEGER		
2465	K	INTEGER		
2472	KAX	INTEGER		
21406	KEX	INTEGER	ARRAY	
17563	KIN	INTEGER	ARRAY	
2550	KJO	INTEGER		
2471	KMIN	INTEGER		
1	KNUM	INTEGER		INDICE
4504	KOUT	INTEGER	ARRAY	
17354	KSETS	INTEGER	ARRAY	
0	KTITLE	INTEGER	ARRAY	TITLES
2500	KYTRAN	INTEGER		
2531	L	INTEGER		
2541	LB	INTEGER		
50	LTITLE	INTEGER	ARRAY	TITLES
2513	MARK	INTEGER		
2503	MAX	INTEGER		
2524	MIN	INTEGER		
2561	MJB	INTEGER		
2514	MT	INTEGER		
2571	MZ	INTEGER		
2522	M2	INTEGER		
4	NP	INTEGER		INDICE
2474	NSTEP	INTEGER		
2532	NV	INTEGER		
2562	ORGVAR	REAL		
2563	PEREXP	REAL		
4224	R	REAL	ARRAY	
2574	AEXP	REAL		
17576	B	REAL	ARRAY	
4020	C	REAL	ARRAY	
2530	CONB	REAL		
2567	CONST	REAL		
4211	CY	REAL	ARRAY	
2537	C2	REAL		
2536	DEGF	REAL		
2601	DIFF	REAL		
26	EXPO	REAL	ARRAY	KEYS
4456	FLEV	REAL	ARRAY	
0	FLEVEN	REAL		F.P.
2556	FMAX	REAL		
2576	FOFX	REAL		
2554	IDEG	INTEGER		
17367	IFORM	INTEGER	ARRAY	
2473	IMW	INTEGER		
2467	ISW	INTEGER		
2553	ITDEG	INTEGER		
13	ITRANS	INTEGER	ARRAY	KEYS
2546	IXX	INTEGER		
2464	J	INTEGER		
2466	JAY	INTEGER		
2525	JC	INTEGER		
2501	KA	INTEGER		
0	KCONT	INTEGER		INDICE
4430	KFA	INTEGER	ARRAY	
2557	KJI	INTEGER		
2551	KMAX	INTEGER		
2555	KN	INTEGER		
2572	KO	INTEGER		
54	KRANK	INTEGER	ARRAY	KEYS
41	KSORT	INTEGER	ARRAY	KEYS
0	KVAR	INTEGER		F.P.
2540	KZ	INTEGER		
2526	LA	INTEGER		
2575	LINE	INTEGER		
2507	M	INTEGER		
2542	MATE	INTEGER		
4545	MEANS	REAL	ARRAY	
2560	MJA	INTEGER		
2517	MRS	INTEGER		
0	MVAR	INTEGER	ARRAY	F.P.
2521	M1	INTEGER		
2476	NA	INTEGER		
2516	NQ	INTEGER		
200	NTITLE	INTEGER		TITLES
2506	NX	INTEGER		
4517	PARFL	REAL	ARRAY	
2564	PERUNE	REAL		
21360	REGCOF	REAL	ARRAY	

VARIABLES	SN	TYPE	RELOCATION						
2565	RESQR	REAL			2570	RMULT	REAL		
4415	RY	REAL	ARRAY		4005	STDERC	REAL	*UNDEF	
4471	STDEV	REAL	ARRAY		2535	STDEVY	REAL		
21373	STOREG	REAL	ARRAY		2566	STORES	REAL		
2534	STDY	REAL			4443	STUDT	REAL	ARRAY	
4532	SUMS	REAL	ARRAY		2511	SUMY	REAL		
3566	SX	REAL	ARRAY		3601	SY	REAL	ARRAY	
2523	SY2	REAL			17371	TEMP	REAL	ARRAY	
17535	TEMPA	REAL	ARRAY		2552	VMAX	REAL		
17550	V4	REAL	ARRAY		4560	X	REAL	ARRAY	
0	XOB	REAL	ARRAY	VARBLS	12574	XRT	REAL	ARRAY	VARBLS
2602	Y	REAL	ARRAY		2577	YCOMP	REAL		
2477	YEXP	REAL			2512	YMEAN	REAL		
2600	YOBS	REAL							

FILE NAMES	MODE		
INPUT	FMT	OUTPUT	FMT

EXTERNALS	TYPE	ARGS				
EXIT		0	EXP	REAL	1 LIBRARY	
SQRT	REAL	1 LIBRARY				

STATEMENT LABELS

0	1		0	2		0	3				
62	4		0	5		101	6				
104	7		0	8		130	9				
0	11		0	12		0	13				
0	14		212	15		0	16				
260	17		303	18		347	20				
353	25		364	30		371	35				
0	40	INACTIVE	0	45		0	50				
0	55		0	56	INACTIVE	523	57				
0	58		1577	73	FMT	1607	74	FMT			
0	85	INACTIVE	1614	86	FMT	0	90				
562	91		0	92		1626	93	FMT			
603	94		1637	97	FMT	0	98				
623	150		1653	160	FMT	1660	200	FMT			
626	300		0	310		650	320				
654	330		660	335		662	340				
1677	350	FMT	715	355		733	358				
0	360		741	400		0	410				
0	415		764	420		1015	430				
1722	435	FMT	1734	437	FMT	1027	440				
1765	450	FMT	2003	460	FMT	2015	470	FMT			
1062	475		2033	500	FMT	1071	541				
1074	542		1113	543		1126	544				
0	545		0	547		1142	548				
1162	551		1165	553		0	555				
1210	556		1212	558		0	570				
1272	700		2054	710	FMT	2070	715	FMT			
2116	720	FMT	2165	725	FMT	2210	726	FMT			
0	727		2231	860	FMT	2246	870	FMT			
0	880		2254	890	FMT	1361	900				
0	903		1427	905		2273	910	FMT			
0	920		2303	930	FMT	1443	932				
0	935		1457	940		2317	945	FMT			
1500	950		0	955		1516	960				

STATEMENT LABELS

1520	965		0	970		1543	1000	
2341	1010	FMT	1546	1040		2352	1050	FMT
1551	1060		2363	1070	FMT	1554	1080	
2377	1090	FMT	1561	1100		2427	1110	FMT
1566	2000							

COMMON BLOCKS LENGTH

VARBLS	11000
TITLES	129
INDICE	8
KEYS	55

STATISTICS

PROGRAM LENGTH	214218	8977
CM LABELED COMMON LENGTH	256708	11192

PROBLEM INFORMATION

THIS IS AN EXAMPLE PROBLEM
DATA FROM RALSTON AND WILF-M.A. EFROYMSON

X(1) = THIS IS THE VARIABLE NO. 1
X(2) = THIS IS VARIABLE NO. 2
X(3) = THIS IS VARIABLE NO. 3
X(4) = THIS IS VARIABLE NO. 4

NUMBER OF EVENTS = 15 NUMBER OF VARIABLES = 4

INDEX OF INDEPENDENT VARIABLE = 4

F LEVEL TO ENTER = 2.5000 F LEVEL TO EXCLUDE = 2.5000

LIST OF INPUT VARIABLES

X(1)	X(2)	X(3)	X(4)
32.000000	48.000000	54.000000	15.000000
36.000000	33.000000	19.000000	16.000000
3.000000	28.000000	30.000000	14.000000
12.000000	33.000000	64.000000	22.000000
36.000000	34.000000	60.000000	24.000000
24.000000	36.000000	53.000000	19.000000
19.000000	42.000000	29.000000	13.000000
20.000000	33.000000	55.000000	15.000000
27.000000	36.000000	62.000000	23.000000
15.000000	22.000000	33.000000	12.000000
45.000000	46.000000	68.000000	25.000000
9.000000	28.000000	42.000000	17.000000
11.000000	32.000000	45.000000	18.000000
33.000000	34.000000	39.000000	19.000000
21.000000	45.000000	39.000000	18.000000

LIST OF RESIDUALS FOR STEP NUMBER 2

THIS IS AN EXAMPLE PROBLEM
DATA FROM RALSTON AND WILF-M.A. EFROYMSON

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	15.000000	20.370429	-5.370429
2	16.000000	14.410071	1.589929
3	14.000000	13.021937	.978063
4	22.000000	20.135929	1.864071
5	24.000000	21.873634	2.126366
6	19.000000	19.366438	-.366438
7	13.000000	14.483803	-1.483803
8	15.000000	19.319538	-4.319538
9	23.000000	21.313013	1.686987
10	12.000000	14.800980	-2.800980
11	25.000000	24.254635	.745365
12	17.000000	15.822858	1.177142
13	18.000000	16.574461	1.425539
14	19.000000	17.742601	1.257399
15	18.000000	16.509673	1.490327

SUM OF DEVIATIONS SQUARED = 79.783474

REGRESSION INFORMATION FOR STEP NO. 2

VARIABLE ENTERING REGRESSION THIS STEP IS X(1) F LEVEL TO ENTER = 2.847233

ORIGINAL VARIANCE	228.0000
PERCENT EXPLAINED VARIANCE	65.0072
PERCENT UNEXPLAINED VARIANCE	34.9928
MULTIPLE CORRELATION COEFF	.8063
RESIDUAL SUM OF SQUARES	79.7835
STANDARD ERROR OF RESIDUALS	2.5785
DEGREES OF FREEDOM OF REGRESSION	2
DEGREES OF FREEDOM OF RESIDUALS	12
CONSTANT	7.2526

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
3	.182038	.049293	13.638363
1	.102744	.060890	2.847233

RAW SUMS OF SQUARES AND PRODUCTS-OR (A) MATRIX

15.0	343.0	530.0	692.0	270.0
	9817.0	12793.0	16561.0	6511.0
		19456.0	24935.0	9657.0
			34936.0	13080.0

COVARIANCE MATRIX OR (C) MATRIX

1973.733	673.667	737.267	337.000
	729.333	484.333	117.000
		3011.733	624.000
			228.000

R MATRIX SIMPLE COEFFICIENTS OF REGRESSION
INITIAL B MATRIX

1.000000	.561485	.302393	.502364
	1.000000	.326793	.286916
		1.000000	.753024
			1.000000

INITIAL REGRESSION INFORMATION

VARIABLE NUMBER	INITIAL F-LEVEL	STUDENT'S T	STANDARD DEVIATION	VARIABLE MEAN
1	4.388263	2.094818	11.873540	22.866667
2	1.166174	1.079895	7.217703	35.333333
3	17.026242	4.126287	14.667100	46.133333

STANDARD ERROR OF Y = 4.035556 MEAN OF Y = 18.000000

SUM OF Y = 270.000000

REGRESSION INFORMATION FOR STEP NO. 1

VARIABLE ENTERING REGRESSION THIS STEP IS X(3) F LEVEL TO ENTER = 17.026242

ORIGINAL VARIANCE	228.0000
PERCENT EXPLAINED VARIANCE	56.7045
PERCENT UNEXPLAINED VARIANCE	43.2955
MULTIPLE CORRELATION COEFF	.7530
RESIDUAL SUM OF SQUARES	98.7137
STANDARD ERROR OF RESIDUALS	2.7556
DEGREES OF FREEDOM OF REGRESSION	1
DEGREES OF FREEDOM OF RESIDUALS	13
CONSTANT	8.4417

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
3	.207190	.050212	17.026242

LIST OF RESIDUALS FOR STEP NUMBER 1

THIS IS AN EXAMPLE PROBLEM
DATA FROM RALSTON AND WILF-M.A. EFROYMSON

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	15.000000	19.629892	-4.629892
2	16.000000	12.378254	3.621746
3	14.000000	14.657340	-.657340
4	22.000000	21.701789	.298211
5	24.000000	20.873030	3.126970
6	19.000000	19.422702	-.422702
7	13.000000	14.450151	-1.450151
8	15.000000	19.837082	-4.837082
9	23.000000	21.287409	1.712591
10	12.000000	15.278909	-3.278909
11	25.000000	22.530547	2.469453
12	17.000000	17.143616	-.143616
13	18.000000	17.765185	.234815
14	19.000000	16.522047	2.477953
15	18.000000	16.522047	1.477953

SUM OF DEVIATIONS SQUARED = 98.713653

REGRESSION INFORMATION FOR STEP NO. 2

VARIABLE ENTERING REGRESSION THIS STEP IS X(1) F LEVEL TO ENTER = 2.847233

ORIGINAL VARIANCE	228.0000
PERCENT EXPLAINED VARIANCE	65.0072
PERCENT UNEXPLAINED VARIANCE	34.9928
MULTIPLE CORRELATION COEFF	.8063
RESIDUAL SUM OF SQUARES	79.7835
STANDARD ERROR OF RESIDUALS	2.5785
DEGREES OF FREEDOM OF REGRESSION	2
DEGREES OF FREEDOM OF RESIDUALS	12
CONSTANT	7.2526

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
3	.182038	.049293	13.638363
1	.102744	.060890	2.847233

LIST OF RESIDUALS FOR STEP NUMBER 2

THIS IS AN EXAMPLE PROBLEM
DATA FROM RALSTON AND WILF-M.A. EFROYMSON

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	15.000000	20.370429	-5.370429
2	16.000000	14.410071	1.589929
3	14.000000	13.021937	.978063
4	22.000000	20.135929	1.864071
5	24.000000	21.873634	2.126366
6	19.000000	19.366438	-.366438
7	13.000000	14.483803	-1.483803
8	15.000000	19.319538	-4.319538
9	23.000000	21.313013	1.686987
10	12.000000	14.800980	-2.800980
11	25.000000	24.254635	.745365
12	17.000000	15.822858	1.177142
13	18.000000	16.574461	1.425539
14	19.000000	17.742601	1.257399
15	18.000000	16.509673	1.490327

SUM OF DEVIATIONS SQUARED = 79.783474

VARIABLE WITH INDEX = 2 HAD A F LEVEL TO ENTER = .489651
WHICH IS LESS THAN ENTRY F LEVEL OF 2.500000 ALL OTHER VARIABLES NOT IN REGRESSION ARE IGNORED

PROBLEM INFORMATION

THIS IS AN EXAMPLE PROBLEM
DATA FROM DRAPER AND SMITH (HALD DATA)

X(1) = THIS IS VARIABLE NUMBER ONE
X(2) = THIS IS VARIABLE NUMBER TWO
X(3) = THIS IS VARIABLE NUMBER THREE
X(4) = THIS IS VARIABLE NUMBER FOUR
X(5) = THIS IS VARIABLE NUMBER FIVE(DEPENDENT VARIABLE)

NUMBER OF EVENTS = 13 NUMBER OF VARIABLES = 5

INDEX OF INDEPENDENT VARIABLE = 5

F LEVEL TO ENTER = 3.9000 F LEVEL TO EXCLUDE = 3.9000

LIST OF INPUT VARIABLES

X(1)	X(2)	X(3)	X(4)	X(5)
7.000000	26.000000	6.000000	60.000000	78.500000
1.000000	29.000000	15.000000	52.000000	74.300000
11.000000	56.000000	8.000000	20.000000	104.300000
11.000000	31.000000	8.000000	47.000000	87.600000
7.000000	52.000000	6.000000	33.000000	95.900000
11.000000	55.000000	9.000000	22.000000	109.200000
3.000000	71.000000	17.000000	6.000000	102.700000
1.000000	31.000000	22.000000	44.000000	72.500000
2.000000	54.000000	18.000000	22.000000	93.100000
21.000000	47.000000	4.000000	26.000000	115.900000
1.000000	40.000000	23.000000	34.000000	83.800000
11.000000	66.000000	9.000000	12.000000	113.300000
10.000000	68.000000	8.000000	12.000000	109.400000

RAW SUMS OF SQUARES AND PRODUCTS-OR (A) MATRIX

13.0	97.0	626.0	153.0	390.0	1240.5
	1139.0	4922.0	769.0	2620.0	10032.0
		33050.0	7201.0	15739.0	62027.8
			2293.0	4628.0	13981.5
				15062.0	34733.3

COVARIANCE MATRIX OR (C) MATRIX

415.231	251.077	-372.615	-290.000	775.962
	2905.692	-166.538	-3041.000	2292.954
		492.308	38.000	-618.231
			3362.000	-2481.700
				2715.763

R MATRIX SIMPLE COEFFICIENTS OF REGRESSION
INITIAL B MATRIX

1.000000	.228579	-.824134	-.245445	.730717
	1.000000	-.139242	-.972955	.816253
		1.000000	.029537	-.534671
			1.000000	-.821305
				1.000000

INITIAL REGRESSION INFORMATION

VARIABLE NUMBER	INITIAL F-LEVEL	STUDENT'S T	STANDARD DEVIATION	VARIABLE MEAN
1	12.602518	3.550002	5.882394	7.461538
2	21.960605	4.686214	15.560881	48.153846
3	4.403417	2.098432	6.405126	11.769231
4	22.798520	4.774780	16.738180	30.000000

STANDARD ERROR OF Y = 15.043723 MEAN OF Y = 95.423077

SUM OF Y = 1240.500000

REGRESSION INFORMATION FOR STEP NO. 1

VARIABLE ENTERING REGRESSION THIS STEP IS X(4) F LEVEL TO ENTER = 22.798520

ORIGINAL VARIANCE	2715.7631
PERCENT EXPLAINED VARIANCE	67.4542
PERCENT UNEXPLAINED VARIANCE	32.5458
MULTIPLE CORRELATION COEFF	.8213
RESIDUAL SUM OF SQUARES	883.8669
STANDARD ERROR OF RESIDUALS	8.9639
DEGREES OF FREEDOM OF REGRESSION	1
DEGREES OF FREEDOM OF RESIDUALS	11
CONSTANT	117.5679

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
4	-.738162	.154596	22.798520

LIST OF RESIDUALS FOR STEP NUMBER 1

THIS IS AN EXAMPLE PROBLEM
DATA FROM DRAPER AND SMITH (HALD DATA)

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	78.500000	73.278223	5.221777
2	74.300000	79.183517	-4.883517
3	104.300000	102.804695	1.495305
4	87.600000	82.874326	4.725674
5	95.900000	93.208591	2.691409
6	109.200000	101.328371	7.871629
7	102.700000	113.138960	-10.438960
8	72.500000	85.088812	-12.588812
9	93.100000	101.328371	-8.228371
10	115.900000	98.375724	17.524276
11	83.800000	92.470430	-8.670430
12	113.300000	108.709989	4.590011
13	109.400000	108.709989	.690011

SUM OF DEVIATIONS SQUARED = 883.866917

REGRESSION INFORMATION FOR STEP NO. 2

VARIABLE ENTERING REGRESSION THIS STEP IS X(1) F LEVEL TO ENTER = 108.223909

ORIGINAL VARIANCE	2715.7631
PERCENT EXPLAINED VARIANCE	97.2471
PERCENT UNEXPLAINED VARIANCE	2.7529
MULTIPLE CORRELATION COEFF	.9861
RESIDUAL SUM OF SQUARES	74.7621
STANDARD ERROR OF RESIDUALS	2.7343
DEGREES OF FREEDOM OF REGRESSION	2
DEGREES OF FREEDOM OF RESIDUALS	10
CONSTANT	103.0974

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
4	-.613954	.048645	159.295210
1	1.439958	.138417	108.223909

LIST OF RESIDUALS FOR STEP NUMBER 2

THIS IS AN EXAMPLE PROBLEM
DATA FROM DRAPER AND SMITH (HALD DATA)

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	78.500000	76.339872	2.160128
2	74.300000	72.611751	1.688249
3	104.300000	106.657850	-2.357850
4	87.600000	90.081102	-2.481102
5	95.900000	92.916620	2.983380
6	109.200000	105.429943	3.770057
7	102.700000	103.733535	-1.033535
8	72.500000	77.523380	-5.023380
9	93.100000	92.470318	.629682
10	115.900000	117.373711	-1.473711
11	83.800000	83.662917	.137083
12	113.300000	111.569479	1.730521
13	109.400000	110.129521	-.729521

SUM OF DEVIATIONS SQUARED = 74.762112

REGRESSION INFORMATION FOR STEP NO. 3

VARIABLE ENTERING REGRESSION THIS STEP IS X(2) F LEVEL TO ENTER = 5.025865

ORIGINAL VARIANCE	2715.7631
PERCENT EXPLAINED VARIANCE	98.2335
PERCENT UNEXPLAINED VARIANCE	1.7665
MULTIPLE CORRELATION COEFF	.9911
RESIDUAL SUM OF SQUARES	47.9727
STANDARD ERROR OF RESIDUALS	2.3087
DEGREES OF FREEDOM OF REGRESSION	3
DEGREES OF FREEDOM OF RESIDUALS	9
CONSTANT	71.6483

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
4	-.236540	.173288	1.863262
1	1.451938	.116998	154.007635
2	.416110	.185610	5.025865

LIST OF RESIDUALS FOR STEP NUMBER 3

THIS IS AN EXAMPLE PROBLEM
DATA FROM DRAPER AND SMITH (HALD DATA).

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	78.500000	78.438314	.061686
2	74.300000	72.867337	1.432663
3	104.300000	106.190967	-1.890967
4	87.600000	89.401637	-1.801637
5	95.900000	95.643753	.256247
6	109.200000	105.301777	3.898223
7	102.700000	104.128673	-1.428673
8	72.500000	75.591878	-3.091878
9	93.100000	91.818225	1.281775
10	115.900000	115.546117	.353883
11	83.800000	81.702268	2.097732
12	113.300000	112.244386	1.055614
13	109.400000	111.624668	-2.224668

SUM OF DEVIATIONS SQUARED = 47.972729

VARIABLE WITH INDEX = 4 HAS BEEN EXCLUDED FROM REGRESSION WITH F LEVEL = 1.863262
WHERE F LEVEL TO EXCLUDE = 3.900000

REGRESSION INFORMATION FOR STEP NO. 2

VARIABLE ENTERING REGRESSION THIS STEP IS X(2) F LEVEL TO ENTER = 5.025865

ORIGINAL VARIANCE	2715.7631
PERCENT EXPLAINED VARIANCE	97.8678
PERCENT UNEXPLAINED VARIANCE	2.1322
MULTIPLE CORRELATION COEFF	.9893
RESIDUAL SUM OF SQUARES	57.9045
STANDARD ERROR OF RESIDUALS	2.4063
DEGREES OF FREEDOM OF REGRESSION	2
DEGREES OF FREEDOM OF RESIDUALS	10
CONSTANT	52.5773

VARIABLE	REGRESSION COEFFICIENTS	STANDARD ERROR	PARTIAL F VALUE
1	1.468306	.121301	146.522655
2	.662250	.045855	208.581823

LIST OF RESIDUALS FOR STEP NUMBER 2

THIS IS AN EXAMPLE PROBLEM
DATA FROM DRAPER AND SMITH (HALD DATA)

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	DEVIATION
1	78.500000	80.074002	-1.574002
2	74.300000	73.250919	1.049081
3	104.300000	105.814740	-1.514740
4	87.600000	89.258477	-1.658477
5	95.900000	97.292515	-1.392515
6	109.200000	105.152489	4.047511
7	102.700000	104.002051	-1.302051
8	72.500000	74.575420	-2.075420
9	93.100000	91.275487	1.824513
10	115.900000	114.537543	1.362457
11	83.800000	80.535674	3.264326
12	113.300000	112.437244	.862756
13	109.400000	112.293440	-2.893440

SUM OF DEVIATIONS SQUARED = 57.904483

VARIABLE WITH INDEX = 4 PREVIOUSLY EXCLUDED

NORMAL OR GAUSSIAN PROBABILITY FUNCTION

The normal or Gaussian probability function is used extensively in modern statistical theory. Problem-solving in the field of hydrology as well as many other related areas very frequently relies in part on the use of the normal probability function.

In this respect a mechanism is required for the solution of the following integral:

$$P(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-t^2/2} dt = \int_{-\infty}^{x} Z(t)\, dt$$

Several polynomials and rational approximations are available for the solution of the above integral. The error of approximation ($\varepsilon(x)$) is: $|\varepsilon(x)| < 7.5*10^{-8}$ for the better approximations. These polynomials are for the most part approximations of the integral with limits $0 \leq x < \infty$ which utilizes the symmetry of the probability function for the limits $-\infty < x < \infty$.

The subroutine, which is described in the subsequent narrative, is an electronic computer application of the approximation of this same integral with the limits $0 \leq x < \infty$ and again with the advantage of symmetry the integral can be approximated over the range $\infty - < x < \infty$.

The most commonly used range of the argument "x" in hydrology is $-4.0 \leq x \leq 4.0$, where tails of the probability function, i.e., $> \pm 4.0$, are considered not significantly different than zero or one.

The power series as shown below was used in the computer application to approximate the solution of the aforementioned integral for the limits $-4.0 \leq x \leq 4.0$. The accuracy, or maximum error with this series, is $|\varepsilon(x)| < 1.0 \times 10^{-8}$.

$$\text{Power series: } P(x) = 1/2 + Z(x) \sum_{n=0}^{n=50} \frac{x^{2n+1}}{1 \cdot 3 \cdot 5 \ldots (2n+1)} + \varepsilon(x)$$

The series was truncated when $|P(x)_n - P(x)_{n+1}| < 1.0 \times 10^{-9}$.

Another mechanism that is required when the normal probability function is used is that of obtaining the inverse of integral. A popular polynomial approximation to this inverse is as follows:

$$x_p = f(t) = t - \frac{a_o + a_1 t}{1 + b_1 t + b_2 t^2} + \varepsilon(p)$$

where: $0 < p \leq 0.5$ and $t = \sqrt{\ell n \, 1/p^2}$

and: $a_o = 2.30753$ $\quad a_1 = 0.2760$ |

$b_1 = 0.99229$ $\quad b_2 = 0.0448$ |

and: $|\varepsilon(p)| < 3.0 \times 10^{-3}$

The above polynomial does not provide the same maximum error term as that in the approximation of the integral in the range, $-4.0 \leq x \leq 4.0$. A Taylor series expansion of the higher derivatives was examined as a method of obtaining a better approximation to the inverse.

Let: $Z(x) = \frac{1}{2\pi} \ell^{-x^2/2}$

then: $Z^{(1)}(x) = -xZ(x)$

$Z^{(2)}(x) = (x^2 - 1)\, Z(x)$

$Z^{(3)}(x) = (3x - x^3)\, Z(x)$

$Z^{(4)}(x) = (x^4 - 6x^2 + 3)\, Z(x)$

Note: $d(u,v)/dx = u \frac{dv}{dx} + v \frac{du}{dx}$ was the general form used in obtaining the higher derivatives.

This approach to the approximation became messy in solving for the required root in terms of the fourth degree polynomial resulting from the Taylor series expansion. The technique as used in the computer application for the solution of inverse of the integral combines the polynomial approximation as described earlier and Newton's method of successive approximations.

Let: $x_o = x_p = f(t) + \varepsilon(p)$ (initial guess)

then: $x_1 = x_o - f(x_o)/f'(x_o)$

or: $x_{n+1} = x_n - f(x_n)/f'(x_n)$, n=1, 2, 3, ..., k

where: $f(x_n) = P(x_n) - C$

$f'(x_n) = Z(x_n)$

C = True value of the integral

The successive approximations were truncated when $|f(x_n)| < 1.0 \times 10^{-9}$. The maximum error is $|\varepsilon(p)| < 1.0 \times 10^{-8}$ for the range $-4.0 \leq x \leq 4.0$.

The electronic computer application has attached a main program called DRIVER. The main program was used to test the maximum error and can be discarded.

The subroutine used to approximate the solution of the integral and its inverse is titled NORM, where the entry for the inverse is titled NORM1.

The subroutine is entered with three arguments labeled XR, PROB, XC. The label XR is the argument entered for the solution of the integral. The label PROB is the value of the integral. When entry is made via NORM1 (inverse of integral), the label PROB is the true value of the integral and the label XC is the approximation of the argument.

The label SEED is the first guess (x_o) and uses the polynomial approximation shown earlier.

All program-controlled error messages are displayed at the terminal.

```
      PROGRAM DRIVER(INPUT,OUTPUT,OUT21,TAPE5=OUT21)
      XT=-4.020 $ LINE=0 $ IW=5
   10 XT=XT+0.02  $ IF(XT.GT.4.0) CALL EXIT
      CALL NORM(XT,PROB,XC)
      CALL NORM1(XT,PROB,XC)
      DIFF=XT-XC
      IF(LINE.NE.0) GO TO 35
      WRITE(IW,30)
   30 FORMAT(1H1,////9X*P(X)*9X*X*12X*XC*11X*DIFF*)
   35 WRITE(IW,40)PROB,XT,XC,DIFF
   40 FORMAT(1X,F12.8,3(2X,F12.8))
      LINE =LINE+1 $ IF(LINE.GT.50) LINE=0
      GO TO 10
      END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
6151 DRIVER

VARIABLES	SN	TYPE	RELOCATION				
6243	DIFF	REAL		6240	IW	INTEGER	
6237	LINE	INTEGER		6241	PROB	REAL	
6242	XC	REAL		6236	XT	REAL	

FILE NAMES	MODE						
0	INPUT	2041	OUTPUT	4102	OUT21	4102	TAPE5

EXTERNALS	TYPE	ARGS			
EXIT		0	NORM	3	
NORM1		3			

STATEMENT LABELS

6156	10		6212	30	FMT	6174	35
6227	40	FMT					

STATISTICS		
PROGRAM LENGTH	1018	65
BUFFER LENGTH	6143B	3171

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 NORM 101 NORM1

VARIABLES	SN	TYPE	RELOCATION						
267	CONST	REAL		301	DENOM	REAL			
317	DIFF	REAL		275	DZX1	REAL			
276	DZX2	REAL		277	DZX3	REAL			
300	DZX4	REAL		310	ERROR	REAL			
273	FACT	REAL		313	ISIGN	INTEGER			
271	ISX	INTEGER		304	K	INTEGER			
306	KN	INTEGER		305	N	INTEGER			
316	NC	INTEGER		311	P	REAL			
173	PI	REAL		302	POFX	REAL			
303	PPOFX	REAL		0	PROB	REAL		F.P.	
312	PROD	REAL		315	SEED	REAL			
314	TEE	REAL		270	X	REAL			
0	XC	REAL	F.P.	0	XR	REAL		F.P.	
320	X1	REAL		272	X2	REAL			
307	ZAP	REAL		274	ZX	REAL			

FILE NAMES	MODE
OUTPUT	FMT

EXTERNALS	TYPE	ARGS				
ALOG	REAL	1	LIBRARY	EXIT		0
EXP	REAL	1	LIBRARY	SQRT	REAL	1 LIBRARY

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS

177	5	FMT	21	10		22	25		
0	35	INACTIVE	0	40		215	45	FMT	
71	50		117	60		226	80	FMT	
147	90		151	100		244	110	FMT	
166	120		172	150					

STATISTICS
PROGRAM LENGTH 3218 209

```
      SUBROUTINE NORM(XR,PROB,XC)
      DATA(PI=3.14159265359)
      CONST=2.0*PI $ CONST=1.0/SQRT(CONST)
      X=ABS(XR) $ IF(X.LE.4.0) GO TO 10
 5    PRINT 5
    5 FORMAT(1X*ARGUMENT IS GREATER THAN LIMIT VALUE*
     1  * OF INTEGRAL IS SET TO 1.0*)
      PROB=1.0 $ GO TO 150
   10 ASSIGN 150 TO ISX
10    25 X2=X*X $ FACT=0.5*X2
      ZX=EXP(-FACT)*CONST $ DZX1=-X*ZX $ DZX2=(X2-1.0)*ZX
      DZX3=((3.0*X)-X2*X)*ZX $ DZX4=((X2*X2)-(6.0*X2)+3.0)*ZX
   35 DENOM=1.0 $ POFX=0.5 $ PPOFX=0.0
      DO 40 K=1,50
15    N=K-1 $ KN=2*N+1 $ ZAP=KN $ DENOM=DENOM*ZAP
      POFX=POFX+ZX*X**KN/DENOM
      ERROR=ABS(POFX-PPOFX) $ IF(ERROR.LT.1.0E-9 ) GO TO 50
      PPOFX=POFX
   40 CONTINUE
20    PRINT 45,N,ERROR
   45 FORMAT(2X*N = *I4,5X*ERROR = *F20.9)
      CALL EXIT
76    50 PROB=POFX $ IF(XR.LT.0.0) PROB=1.0-PROB
      GO TO ISX(150,100)
25    ENTRY NORM1
      P=PROD=PROB $ ISIGN=0
      IF(PROD.GE.0.5) GO TO 60
      ISIGN=1 $ PROD=1.0-PROD
   60 IF(P.GT.0.5) P=1.0-P
30    IF(P.LE.0.0) P=1.0E-5
      TEE=SQRT(ALOG(1.0/(P*P)))
      SEED=(2.30753+0.27061*TEE)/(1.0+0.99229*TEE+0.04481*TEE*TEE)
      SEED=TEE-SEED $ X=SEED $ NC=0
      IF(SEED.LT.4.2) GO TO 90
35    PRINT 80
   80 FORMAT(1X*TRUE VALUE OF INTEGRAL IS GREATER THAN*
     1  /1X*LIMIT ARGUMENT IS SET TO SEED*)
      XC=SEED $ GO TO 120
   90 ASSIGN 100 TO ISX $ GO TO 25
40   100 DIFF=POFX-PROD $ IF(ABS(DIFF).LT.1.0E-9) GO TO 120
      X1=X-(DIFF/ZX) $ NC=NC+1
      X=X1 $ IF(NC.LT.30)  GO TO 90
      PRINT 110,X
  110 FORMAT(2X*NO CONVERGENCE FOUND IN X ERROR = *F15.9)
45    CALL EXIT
  120 XC=X $ IF(ISIGN.EQ.1) XC=-XC
  150 RETURN
      END
```

P(X)	X	XC	DIFF
.00003167	-4.00000000	-4.00000000	-.00000000
.00003446	-3.98000000	-3.98000000	-.00000000
.00003748	-3.96000000	-3.96000000	-.00000000
.00004074	-3.94000000	-3.94000000	-.00000000
.00004427	-3.92000000	-3.92000000	-.00000000
.00004810	-3.90000000	-3.90000000	-.00000000
.00005223	-3.88000000	-3.88000000	-.00000000
.00005669	-3.86000000	-3.86000000	-.00000000
.00006152	-3.84000000	-3.84000000	-.00000000
.00006673	-3.82000000	-3.82000000	-.00000000
.00007235	-3.80000000	-3.80000000	-.00000000
.00007841	-3.78000000	-3.78000000	-.00000000
.00008496	-3.76000000	-3.76000000	-.00000000
.00009201	-3.74000000	-3.74000000	-.00000000
.00009961	-3.72000000	-3.72000000	-.00000000
.00010780	-3.70000000	-3.70000000	-.00000000
.00011662	-3.68000000	-3.68000000	-.00000000
.00012611	-3.66000000	-3.66000000	-.00000000
.00013632	-3.64000000	-3.64000000	-.00000000
.00014730	-3.62000000	-3.62000000	-.00000000
.00015911	-3.60000000	-3.60000000	-.00000000
.00017180	-3.58000000	-3.58000000	-.00000000
.00018543	-3.56000000	-3.56000000	-.00000000
.00020006	-3.54000000	-3.54000000	-.00000000
.00021577	-3.52000000	-3.52000000	-.00000000
.00023263	-3.50000000	-3.50000000	-.00000000
.00025071	-3.48000000	-3.48000000	-.00000000
.00027009	-3.46000000	-3.46000000	-.00000000
.00029086	-3.44000000	-3.44000000	-.00000000
.00031311	-3.42000000	-3.42000000	-.00000000
.00033693	-3.40000000	-3.40000000	-.00000000
.00036243	-3.38000000	-3.38000000	-.00000000
.00038971	-3.36000000	-3.36000000	-.00000000
.00041889	-3.34000000	-3.34000000	-.00000000
.00045009	-3.32000000	-3.32000000	-.00000000
.00048342	-3.30000000	-3.30000000	-.00000000
.00051904	-3.28000000	-3.28000000	-.00000000
.00055706	-3.26000000	-3.26000000	-.00000000
.00059765	-3.24000000	-3.24000000	-.00000000
.00064095	-3.22000000	-3.22000000	-.00000000
.00068714	-3.20000000	-3.20000000	-.00000000
.00073638	-3.18000000	-3.18000000	-.00000000
.00078885	-3.16000000	-3.16000000	-.00000000
.00084474	-3.14000000	-3.14000000	-.00000000
.00090426	-3.12000000	-3.12000000	-.00000000
.00096760	-3.10000000	-3.10000000	-.00000000
.00103500	-3.08000000	-3.08000000	-.00000000
.00110669	-3.06000000	-3.06000000	-.00000000
.00118289	-3.04000000	-3.04000000	-.00000000
.00126387	-3.02000000	-3.02000000	-.00000000
.00134990	-3.00000000	-3.00000000	-.00000000

P(X)	X	XC	DIFF
.00144124	-2.98000000	-2.98000000	-.00000000
.00153820	-2.96000000	-2.96000000	-.00000000
.00164106	-2.94000000	-2.94000000	-.00000000
.00175016	-2.92000000	-2.92000000	-.00000000
.00186581	-2.90000000	-2.90000000	-.00000000
.00198838	-2.88000000	-2.88000000	-.00000000
.00211821	-2.86000000	-2.86000000	-.00000000
.00225568	-2.84000000	-2.84000000	-.00000000
.00240118	-2.82000000	-2.82000000	-.00000000
.00255513	-2.80000000	-2.80000000	-.00000000
.00271794	-2.78000000	-2.78000000	-.00000000
.00289007	-2.76000000	-2.76000000	-.00000000
.00307196	-2.74000000	-2.74000000	-.00000000
.00326410	-2.72000000	-2.72000000	-.00000000
.00346697	-2.70000000	-2.70000000	-.00000000
.00368111	-2.68000000	-2.68000000	-.00000000
.00390703	-2.66000000	-2.66000000	-.00000000
.00414530	-2.64000000	-2.64000000	-.00000000
.00439649	-2.62000000	-2.62000000	-.00000000
.00466119	-2.60000000	-2.60000000	-.00000000
.00494002	-2.58000000	-2.58000000	-.00000000
.00523361	-2.56000000	-2.56000000	-.00000000
.00554262	-2.54000000	-2.54000000	-.00000000
.00586774	-2.52000000	-2.52000000	-.00000000
.00620967	-2.50000000	-2.50000000	-.00000000
.00656912	-2.48000000	-2.48000000	-.00000000
.00694685	-2.46000000	-2.46000000	-.00000000
.00734363	-2.44000000	-2.44000000	-.00000000
.00776025	-2.42000000	-2.42000000	-.00000000
.00819754	-2.40000000	-2.40000000	-.00000000
.00865632	-2.38000000	-2.38000000	-.00000000
.00913747	-2.36000000	-2.36000000	-.00000000
.00964187	-2.34000000	-2.34000000	-.00000000
.01017044	-2.32000000	-2.32000000	-.00000000
.01072411	-2.30000000	-2.30000000	-.00000000
.01130384	-2.28000000	-2.28000000	-.00000000
.01191063	-2.26000000	-2.26000000	-.00000000
.01254546	-2.24000000	-2.24000000	-.00000000
.01320938	-2.22000000	-2.22000000	-.00000000
.01390345	-2.20000000	-2.20000000	-.00000000
.01462873	-2.18000000	-2.18000000	-.00000000
.01538633	-2.16000000	-2.16000000	-.00000000
.01617738	-2.14000000	-2.14000000	-.00000000
.01700302	-2.12000000	-2.12000000	-.00000000
.01786442	-2.10000000	-2.10000000	-.00000000
.01876277	-2.08000000	-2.08000000	-.00000000
.01969927	-2.06000000	-2.06000000	-.00000000
.02067516	-2.04000000	-2.04000000	-.00000000
.02169169	-2.02000000	-2.02000000	-.00000000
.02275013	-2.00000000	-2.00000000	-.00000000
.02385176	-1.98000000	-1.98000000	-.00000000

P(X)	X	XC	DIFF
.02499790	-1.96000000	-1.96000000	.00000000
.02618984	-1.94000000	-1.94000000	.00000000
.02742895	-1.92000000	-1.92000000	.00000000
.02871656	-1.90000000	-1.90000000	-.00000000
.03005404	-1.88000000	-1.88000000	.00000000
.03144276	-1.86000000	-1.86000000	.00000000
.03288412	-1.84000000	-1.84000000	-.00000000
.03437950	-1.82000000	-1.82000000	.00000000
.03593032	-1.80000000	-1.80000000	-.00000000
.03753798	-1.78000000	-1.78000000	-.00000000
.03920390	-1.76000000	-1.76000000	-.00000000
.04092951	-1.74000000	-1.73999999	-.00000001
.04271622	-1.72000000	-1.72000000	.00000000
.04456546	-1.70000000	-1.70000000	.00000000
.04647866	-1.68000000	-1.68000000	.00000000
.04845723	-1.66000000	-1.66000000	-.00000000
.05050258	-1.64000000	-1.64000000	.00000000
.05261614	-1.62000000	-1.62000000	.00000000
.05479929	-1.60000000	-1.60000000	-.00000000
.05705343	-1.58000000	-1.58000000	-.00000000
.05937994	-1.56000000	-1.56000000	-.00000000
.06178018	-1.54000000	-1.54000000	-.00000000
.06425549	-1.52000000	-1.52000000	-.00000000
.06680720	-1.50000000	-1.50000000	-.00000000
.06943662	-1.48000000	-1.48000000	-.00000000
.07214504	-1.46000000	-1.46000000	-.00000000
.07493370	-1.44000000	-1.44000000	-.00000000
.07780384	-1.42000000	-1.42000000	-.00000000
.08075666	-1.40000000	-1.40000000	-.00000000
.08379332	-1.38000000	-1.38000000	-.00000000
.08691496	-1.36000000	-1.36000000	-.00000000
.09012267	-1.34000000	-1.34000000	-.00000000
.09341751	-1.32000000	-1.32000000	-.00000000
.09680048	-1.30000000	-1.30000000	-.00000000
.10027257	-1.28000000	-1.28000000	-.00000000
.10383469	-1.26000000	-1.26000000	-.00000000
.10748770	-1.24000000	-1.24000000	-.00000000
.11123244	-1.22000000	-1.22000000	-.00000000
.11506967	-1.20000000	-1.20000000	-.00000000
.11900011	-1.18000000	-1.18000000	-.00000000
.12302440	-1.16000000	-1.16000000	-.00000000
.12714315	-1.14000000	-1.14000000	-.00000000
.13135688	-1.12000000	-1.12000000	-.00000000
.13566606	-1.10000000	-1.10000000	-.00000000
.14007109	-1.08000000	-1.08000000	-.00000000
.14457230	-1.06000000	-1.06000000	-.00000000
.14916995	-1.04000000	-1.04000000	-.00000000
.15386423	-1.02000000	-1.02000000	-.00000000
.15865525	-1.00000000	-1.00000000	-.00000000
.16354306	-.98000000	-.98000000	-.00000000
.16852761	-.96000000	-.96000000	-.00000000

P(X)	X	XC	DIFF
.17360878	-.94000000	-.94000000	-.00000000
.17878638	-.92000000	-.92000000	-.00000000
.18406013	-.90000000	-.90000000	-.00000000
.18942965	-.88000000	-.88000000	-.00000000
.19489452	-.86000000	-.86000000	-.00000000
.20045419	-.84000000	-.84000000	-.00000000
.20610805	-.82000000	-.82000000	-.00000000
.21185540	-.80000000	-.80000000	-.00000000
.21769544	-.78000000	-.78000000	-.00000000
.22362729	-.76000000	-.76000000	-.00000000
.22965000	-.74000000	-.74000000	-.00000000
.23576250	-.72000000	-.72000000	-.00000000
.24196365	-.70000000	-.70000000	-.00000000
.24825223	-.68000000	-.68000000	-.00000000
.25462691	-.66000000	-.66000000	-.00000000
.26108630	-.64000000	-.64000000	-.00000000
.26762889	-.62000000	-.62000000	-.00000000
.27425312	-.60000000	-.60000000	-.00000000
.28095731	-.58000000	-.58000000	-.00000000
.28773972	-.56000000	-.56000000	-.00000000
.29459852	-.54000000	-.54000000	-.00000000
.30153179	-.52000000	-.52000000	-.00000000
.30853754	-.50000000	-.50000000	-.00000000
.31561370	-.48000000	-.48000000	-.00000000
.32275811	-.46000000	-.46000000	-.00000000
.32996855	-.44000000	-.44000000	-.00000000
.33724273	-.42000000	-.42000000	-.00000000
.34457826	-.40000000	-.40000000	-.00000000
.35197271	-.38000000	-.38000000	-.00000000
.35942357	-.36000000	-.36000000	-.00000000
.36692826	-.34000000	-.34000000	-.00000000
.37448417	-.32000000	-.32000000	-.00000000
.38208858	-.30000000	-.30000000	-.00000000
.38973875	-.28000000	-.28000000	-.00000000
.39743189	-.26000000	-.26000000	-.00000000
.40516513	-.24000000	-.24000000	-.00000000
.41293558	-.22000000	-.22000000	-.00000000
.42074029	-.20000000	-.20000000	-.00000000
.42857628	-.18000000	-.18000000	0.00000000
.43644054	-.16000000	-.16000000	.00000000
.44433000	-.14000000	-.14000000	-.00000000
.45224157	-.12000000	-.12000000	.00000000
.46017216	-.10000000	-.10000000	-.00000000
.46811863	-.08000000	-.08000000	.00000000
.47607782	-.06000000	-.06000000	-.00000000
.48404656	-.04000000	-.04000000	.00000000
.49202169	-.02000000	-.02000000	-.00000000
.50000000	.00000000	.00000000	-.00000000
.50797831	.02000000	.02000000	.00000000
.51595344	.04000000	.04000000	-.00000000
.52392218	.06000000	.06000000	-.00000000

P(X)	X	XC	DIFF
.53188137	.08000000	.08000000	.00000000
.53982784	.10000000	.10000000	.00000000
.54775843	.12000000	.12000000	.00000000
.55567000	.14000000	.14000000	.00000000
.56355946	.16000000	.16000000	.00000000
.57142372	.18000000	.18000000	.00000000
.57925971	.20000000	.20000000	.00000000
.58706442	.22000000	.22000000	.00000000
.59483487	.24000000	.24000000	.00000000
.60256811	.26000000	.26000000	.00000000
.61026125	.28000000	.28000000	.00000000
.61791142	.30000000	.30000000	.00000000
.62551583	.32000000	.32000000	.00000000
.63307174	.34000000	.34000000	.00000000
.64057643	.36000000	.36000000	.00000000
.64802729	.38000000	.38000000	.00000000
.65542174	.40000000	.40000000	.00000000
.66275727	.42000000	.42000000	.00000000
.67003145	.44000000	.44000000	.00000000
.67724189	.46000000	.46000000	.00000000
.68438630	.48000000	.48000000	.00000000
.69146246	.50000000	.50000000	.00000000
.69846821	.52000000	.52000000	.00000000
.70540148	.54000000	.54000000	.00000000
.71226028	.56000000	.56000000	.00000000
.71904269	.58000000	.58000000	.00000000
.72574688	.60000000	.60000000	.00000000
.73237111	.62000000	.62000000	.00000000
.73891370	.64000000	.64000000	.00000000
.74537309	.66000000	.66000000	.00000000
.75174777	.68000000	.68000000	.00000000
.75803635	.70000000	.70000000	.00000000
.76423750	.72000000	.72000000	.00000000
.77035000	.74000000	.74000000	.00000000
.77637271	.76000000	.76000000	.00000000
.78230456	.78000000	.78000000	.00000000
.78814460	.80000000	.80000000	.00000000
.79389195	.82000000	.82000000	.00000000
.79954581	.84000000	.84000000	.00000000
.80510548	.86000000	.86000000	.00000000
.81057035	.88000000	.88000000	.00000000
.81593987	.90000000	.90000000	.00000000
.82121362	.92000000	.92000000	.00000000
.82639122	.94000000	.94000000	.00000000
.83147239	.96000000	.96000000	.00000000
.83645694	.98000000	.98000000	.00000000
.84134475	1.00000000	1.00000000	.00000000
.84613577	1.02000000	1.02000000	.00000000
.85083005	1.04000000	1.04000000	.00000000
.85542770	1.06000000	1.06000000	.00000000
.85992891	1.08000000	1.08000000	.00000000

P(X)	X	XC	DIFF
.86433394	1.10000000	1.10000000	.00000000
.86864312	1.12000000	1.12000000	.00000000
.87285685	1.14000000	1.14000000	.00000000
.87697560	1.16000000	1.16000000	.00000000
.88099989	1.18000000	1.18000000	.00000000
.88493033	1.20000000	1.20000000	.00000000
.88876756	1.22000000	1.22000000	.00000000
.89251230	1.24000000	1.24000000	.00000000
.89616532	1.26000000	1.26000000	.00000000
.89972743	1.28000000	1.28000000	.00000000
.90319952	1.30000000	1.30000000	.00000000
.90658249	1.32000000	1.32000000	.00000000
.90987733	1.34000000	1.34000000	.00000000
.91308504	1.36000000	1.36000000	.00000000
.91620668	1.38000000	1.38000000	.00000000
.91924334	1.40000000	1.40000000	.00000000
.92219616	1.42000000	1.42000000	.00000000
.92506630	1.44000000	1.44000000	.00000000
.92785496	1.46000000	1.46000000	.00000000
.93056338	1.48000000	1.48000000	.00000000
.93319280	1.50000000	1.50000000	.00000000
.93574451	1.52000000	1.52000000	.00000000
.93821982	1.54000000	1.54000000	.00000000
.94062006	1.56000000	1.56000000	.00000000
.94294657	1.58000000	1.58000000	.00000000
.94520071	1.60000000	1.60000000	.00000000
.94738386	1.62000000	1.62000000	.00000000
.94949742	1.64000000	1.64000000	.00000000
.95154277	1.66000000	1.66000000	.00000000
.95352134	1.68000000	1.68000000	.00000000
.95543454	1.70000000	1.70000000	.00000000
.95728378	1.72000000	1.72000000	.00000000
.95907049	1.74000000	1.73999999	.00000001
.96079610	1.76000000	1.76000000	.00000000
.96246202	1.78000000	1.78000000	.00000000
.96406968	1.80000000	1.80000000	.00000000
.96562050	1.82000000	1.82000000	.00000000
.96711588	1.84000000	1.84000000	.00000000
.96855724	1.86000000	1.86000000	.00000000
.96994596	1.88000000	1.88000000	.00000000
.97128344	1.90000000	1.90000000	.00000000
.97257105	1.92000000	1.92000000	.00000000
.97381016	1.94000000	1.94000000	.00000000
.97500210	1.96000000	1.96000000	.00000000
.97614824	1.98000000	1.98000000	.00000000
.97724987	2.00000000	2.00000000	.00000000
.97830831	2.02000000	2.02000000	.00000000
.97932484	2.04000000	2.04000000	.00000000
.98030073	2.06000000	2.06000000	.00000000
.98123723	2.08000000	2.08000000	.00000000
.98213558	2.10000000	2.10000000	.00000000

P(X)	X	XC	DIFF
.98299698	2.12000000	2.12000000	.00000000
.98382262	2.14000000	2.14000000	.00000000
.98461367	2.16000000	2.16000000	.00000000
.98537127	2.18000000	2.18000000	.00000000
.98609655	2.20000000	2.20000000	.00000000
.98679062	2.22000000	2.22000000	.00000000
.98745454	2.24000000	2.24000000	.00000000
.98808937	2.26000000	2.26000000	.00000000
.98869616	2.28000000	2.28000000	.00000000
.98927589	2.30000000	2.30000000	.00000000
.98982956	2.32000000	2.32000000	.00000000
.99035813	2.34000000	2.34000000	.00000000
.99086253	2.36000000	2.36000000	.00000000
.99134368	2.38000000	2.38000000	.00000000
.99180246	2.40000000	2.40000000	.00000000
.99223975	2.42000000	2.42000000	.00000000
.99265637	2.44000000	2.44000000	.00000000
.99305315	2.46000000	2.46000000	.00000000
.99343088	2.48000000	2.48000000	.00000000
.99379033	2.50000000	2.50000000	.00000000
.99413226	2.52000000	2.52000000	.00000000
.99445738	2.54000000	2.54000000	.00000000
.99476639	2.56000000	2.56000000	.00000000
.99505998	2.58000000	2.58000000	.00000000
.99533881	2.60000000	2.60000000	.00000000
.99560351	2.62000000	2.62000000	.00000000
.99585470	2.64000000	2.64000000	.00000000
.99609297	2.66000000	2.66000000	.00000000
.99631889	2.68000000	2.68000000	.00000000
.99653303	2.70000000	2.70000000	.00000000
.99673590	2.72000000	2.72000000	.00000000
.99692804	2.74000000	2.74000000	.00000000
.99710993	2.76000000	2.76000000	.00000000
.99728206	2.78000000	2.78000000	.00000000
.99744487	2.80000000	2.80000000	.00000000
.99759882	2.82000000	2.82000000	.00000000
.99774432	2.84000000	2.84000000	.00000000
.99788179	2.86000000	2.86000000	.00000000
.99801162	2.88000000	2.88000000	.00000000
.99813419	2.90000000	2.90000000	.00000000
.99824984	2.92000000	2.92000000	.00000000
.99835894	2.94000000	2.94000000	.00000000
.99846180	2.96000000	2.96000000	.00000000
.99855876	2.98000000	2.98000000	.00000000
.99865010	3.00000000	3.00000000	.00000000
.99873613	3.02000000	3.02000000	.00000000
.99881711	3.04000000	3.04000000	.00000000
.99889331	3.06000000	3.06000000	.00000000
.99896500	3.08000000	3.08000000	.00000000
.99903240	3.10000000	3.10000000	.00000000
.99909574	3.12000000	3.12000000	.00000000

P(X)	X	XC	DIFF
.99915526	3.14000000	3.14000000	.00000000
.99921115	3.16000000	3.16000000	.00000000
.99926362	3.18000000	3.18000000	.00000000
.99931286	3.20000000	3.20000000	.00000000
.99935905	3.22000000	3.22000000	.00000000
.99940235	3.24000000	3.24000000	.00000000
.99944294	3.26000000	3.26000000	.00000000
.99948096	3.28000000	3.28000000	.00000000
.99951658	3.30000000	3.30000000	.00000000
.99954991	3.32000000	3.32000000	.00000000
.99958111	3.34000000	3.34000000	.00000000
.99961029	3.36000000	3.36000000	.00000000
.99963757	3.38000000	3.38000000	.00000000
.99966307	3.40000000	3.40000000	.00000000
.99968689	3.42000000	3.42000000	.00000000
.99970914	3.44000000	3.44000000	.00000000
.99972991	3.46000000	3.46000000	.00000000
.99974929	3.48000000	3.48000000	.00000000
.99976737	3.50000000	3.50000000	.00000000
.99978423	3.52000000	3.52000000	.00000000
.99979994	3.54000000	3.54000000	.00000000
.99981457	3.56000000	3.56000000	.00000000
.99982820	3.58000000	3.58000000	.00000000
.99984089	3.60000000	3.60000000	.00000000
.99985270	3.62000000	3.62000000	.00000000
.99986368	3.64000000	3.64000000	.00000000
.99987389	3.66000000	3.66000000	.00000000
.99988338	3.68000000	3.68000000	.00000000
.99989220	3.70000000	3.70000000	.00000000
.99990039	3.72000000	3.72000000	.00000000
.99990799	3.74000000	3.74000000	.00000000
.99991504	3.76000000	3.76000000	.00000000
.99992159	3.78000000	3.78000000	.00000000
.99992765	3.80000000	3.80000000	.00000000
.99993327	3.82000000	3.82000000	.00000000
.99993848	3.84000000	3.84000000	.00000000
.99994331	3.86000000	3.86000000	.00000000
.99994777	3.88000000	3.88000000	.00000000
.99995190	3.90000000	3.90000000	.00000000
.99995573	3.92000000	3.92000000	.00000000
.99995926	3.94000000	3.94000000	.00000000
.99996252	3.96000000	3.96000000	.00000000
.99996554	3.98000000	3.98000000	.00000000

BETA DISTRIBUTION

A random variable is said to have a beta distribution if its probability density is:

$$f(x) = \begin{cases} k.X^{a-1} (1 - X)^{b-1} & \text{for } 0 < X < 1 \\ 0 & \text{elsewhere} \end{cases}$$

where $k = \dfrac{\Gamma(a + b)}{\Gamma(a)\ \Gamma(b)}$

It is obvious from the above that the beta distribution is a two-parameter function and the distribution is related to the gamma distributions.

The beta distribution is fundamental in the solution of the I and J integrals used in total sediment in transport analysis. This distribution is also fundamental in the determination of the distribution of sediment deposited in a reservoir. This distribution is used extensively when the argument "X" (or its transform) is in the range zero to one.

The integral of f(x) is evaluated from "0" to "x" with the use of the following derivation:

Let the beta density function be defined as:

$$f(x) = \frac{X^{a-1}(1-X)^{b-1}}{\beta(a, b)} \quad \text{where } 0 \leq X \leq 1 \text{ and } a > 0,\ b > 0$$

and the beta distribution function be defined as:

$$F(x) = \frac{1}{\beta(a, b)} \int_0^x t^{a-1} (1 - t^{b-1} dt$$

where

$$\beta(a,b) = \int_0^1 t^{a-1} (1 - t)^{b-1} dt = \frac{\Gamma(a)\ \Gamma(b)}{\Gamma(a + b)} \qquad (1)$$

See 6.2.1, page 258, Handbook of Mathematical Functions, U. S. Department of Commerce, National Bureau of Standards, Applied Mathematics Series 55, June 1964. On page 263, 6.6.1, of this same handbook the incomplete beta function is:

$$\beta x(a, b) = \int_0^x t^{a-1} (1 - t)^{b-1} dt$$

and

$$F(x) = I_x (a, b) = \beta x(a, b)/\beta(a, b) \qquad (2)$$

and

$$\beta x(a, b) = a^{-1} X^a F(a, 1-b; a+1; X)$$

where F(a, 1-b; a+1; X) is the hypergeometric series.

The circle of convergence of the Gauss hypergeometric series is $|Z| < 1$. Within this circle F is defined as shown:

$$F(a, b; c; z) = \frac{\Gamma(c)}{\Gamma(a)\ \Gamma(b)} \sum_{n=0}^{\infty} \frac{\Gamma(a+n)\ \Gamma(b+n)\ Z^n}{\Gamma(c+n)\ n!}$$

$$= \frac{\Gamma(c)}{\Gamma(a)\ \Gamma(b)} \left[\frac{\Gamma(a)\ \Gamma(b)\ Z^0}{\Gamma(c)\ 0!} + \frac{\Gamma(a+1)\ \Gamma(b+1)\ Z}{\Gamma(c+1)\ 1!} + \right.$$

$$\frac{\Gamma(a+2)\ \Gamma(b+2)\ Z^2}{\Gamma(c+2)\ 2!} + \frac{\Gamma(a+3)\ \Gamma(b+3)\ Z^3}{\Gamma(c+3)\ 3!}$$

$$\left. + \ldots \right]$$

Using recurrence formulas:

$$\Gamma(z+1) = Z\Gamma(z) \text{ and}$$

$$\Gamma(z+n) = (n-1 + z)\ (n - 2 + z) \ldots (1 + Z)\ \Gamma(1 + z)$$

then:

$$F(a, b; c; z) = \frac{\Gamma(c)}{\Gamma(a)\ \Gamma(b)} \left[\frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} + \frac{a\Gamma(a)\ b\Gamma(b)\ Z}{c\Gamma(c)} + \right.$$

$$\frac{a(a+1)\ \Gamma(a)\ b\ (b+1)\ \Gamma(b)\ Z^2}{c(c+1)\ \Gamma(c)\ 2!} +$$

$$\left. \frac{a(a+1)(a+2)\ \Gamma(a)\ b\ (b+1)(b+2)\ \Gamma(b)\ Z^3}{c(c+1)(c+2)\ \Gamma(c)\ 3!} + \ldots \right]$$

and upon further reduction:

$$F(a,\ b;\ c;\ z) = \frac{\Gamma(c)}{\Gamma(a)\ \Gamma(b)} \left[\frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} + \frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} \frac{abz}{c} + \right.$$

$$\frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} \frac{a(a+1)\ b\ (b+1)\ Z^2}{c(c+1)\ 2!} +$$

$$\left. \frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} \frac{a(a+1)(a+2)\ b(b+1)(b+2)Z^3}{c(c+1)(c+2)\ 3!} + \ldots \right]$$

and:

$$F(a,\ b;\ c;\ z) = \frac{\Gamma(c)}{\Gamma(a)\Gamma(b)} \cdot \frac{\Gamma(a)\ \Gamma(b)}{\Gamma(c)} \left[1 + \frac{abz}{\Gamma(c)} + \frac{a(a+1)\ b(b+1)\ Z^2}{c(c+1)\ 2!} \right.$$

$$+ \frac{a(a+1)(a+2)b(b+1)(b+2)\ Z^3}{c(c+1)\ (c+2)\ 3!}$$

$$\left. + \ldots \right]$$

Let: $a = a,\ b = 1 - b,\ c = a + 1,$ and $Z = X$

then:

$$F(a,\ 1\text{-}b;\ a\text{+}1;\ x) = 1 + \frac{a(1-b)X}{a+1} + \frac{a(a+1)(1-b)(1 - b + 1)\ X^2}{(a+1)(a + 1 + 1)\ 2!}$$

$$+ \frac{a(a+1)\ (a+2)\ (1-b)\ (1-b+1)\ (1-b+2)\ X^3}{(a+1)\ (a+1+1)\ (a+1+2)\ 3!} + \ldots$$

and:

$$F(a,\ 1\text{-}b;\ a\text{+}1;\ X) = 1 + \frac{a(1-b)\ X}{(a+1)} + \frac{a(1-b)(2-b)\ X^2}{(a+2)\ 2!} +$$

$$\frac{a(1-b)\ (2-b)\ (3-b)\ X^3}{(a+3)\ 3!} + \ldots$$

then:

$$\beta x(a,b) = a^{-1} X^a \left[1 + a \sum_{n=1}^{\infty} \frac{(n-b)^{(n)}}{(n+a)\ n!} X^n \right] \qquad (3)$$

where b = 1, 2, 3, 4, ...

Substituting equations (1) and (3) into equation (2)

$$I_x(a, b) = \frac{\Gamma(a+b)}{\Gamma(a)\ \Gamma(b)} a^{-1} X^a \left[1 + a \sum_{n=1}^{\infty} \frac{(n-b)^{(n)} X^n}{(n+a)\ n!} \right] \qquad (4)$$

Equation (4) was used to evaluate the incomplete beta function for all values of "a" and "b" over the interval X = 0, X = 1. The results of this evaluation were compared with those shown in Tables of the Incomplete Beta-Function, by Karl Pearson, F.R.S., Cambridge, Published for the Biometrika Trustees at the University Press, reprinted in 1956. The comparison was identical when "b" was an integer; however, for one-half units of "a" with one-half units of "b" the above solution of the integral deteriorated for X > 0.50. By taking advantage of the symmetry which is expressed as follows:

$$I_x(a, b) = 1 - I_{x-1}(b, a) \qquad (5)$$

a good comparison was obtained. In the data analysis model the integral was solved using the series of equation (4) and the symmetry of equation (5) where the series (4) was truncated when the last term was equal to $1 \cdot 10^{-7}$ or less. In the model "a" and "b" were allowed to assume any value greater than zero without

any apparent discontinuity. Solving the inverse of the integral can be accomplished using Newton's method and will be described in a later portion of this narrative.

It is left to the experience of the user to use this technique with good judgment.

Solving for mean and variance of the beta function given "a" and "b", where a > 0 and b > 0

The general term for the derivation of moments is as follows:

$$\mu_r = \frac{\Gamma(a+b)\ \Gamma(a+r)}{\Gamma(a)\ \Gamma(a+b+r)}$$

where r = 1, 2, 3, ... or the first, second, third ... moments.

When r = 1 the first moment or mean is:

$$\mu_1 = \frac{\Gamma(a+b)\ \Gamma(a+1)}{\Gamma(a)\ \Gamma(a+b+1)}$$

Let: $a + b = c$

and the recurrence formula:

$$\Gamma(z+1) = Z\ \Gamma(z)$$

then

$$\mu_1 = \frac{\Gamma(c)\ a\ \Gamma(a)}{\Gamma(a)\ c\ \Gamma(c)} = a/c = \frac{a}{a+b} = \text{mean.}$$

the second moment = μ_2 and:

$$\mu_2 = \frac{\Gamma(a+b)\ \Gamma(a+2)}{\Gamma(a)\ \Gamma(a+b+2)}$$

Let: $a + b = c$

and using the recurrence formulas

$$\Gamma(z+1) = Z\Gamma(z)$$

$$\Gamma(z+n) = (n-1+z)\ (n-2+z)\ \ldots\ (1+z)\ \Gamma(z+1)$$

then

$$\mu_2 = \frac{\Gamma(c)\ a\ (a+1)\ \Gamma(a)}{\Gamma(a)\ c\ (c+1)\ \Gamma(c)} = \frac{a(a+1)}{c(c+1)}$$

or

$$\mu_2 = \frac{a(a+1)}{(a+b)\ (a+b+1)}$$

Variance = $\sigma^2 = E(x^2) - \mu_1^2$ and $E(x^2) = \mu_2$

Then:

$$\sigma^2 = \frac{a(a+1)}{(a+b)\ (a+b+1)} - \frac{a^2}{(a+b)^2}$$

and:

$$\sigma^2 = \frac{a(a+b)\ (a+1) - a^2(a+b+1)}{(a+b)^2\ (a+b+1)}$$

which reduces to:

$$\sigma^2 = \frac{ab}{(a+b)^2\ (a+b+1)} = \text{variance.}$$

Solving for "a" and "b" in terms of mean and variance

Solve first for "b" in terms of "a" and μ_1

$$b = \frac{a(1 - \mu_1)}{\mu_1}$$

Solve for "a" by substitution of "b" in equation for variance

$$a = \mu_1 \left[\frac{(\mu_1 - \mu_1^2)}{\sigma^2} - 1 \right].$$

Inverse of Integral

The inverse of the integral of the beta distribution function was first attempted using Newton's method. The computation of the inverse in this manner proved to be very sensitive at the end points and also lacked continuity for large values of the parameters "a" and "b". The mechanism used was as follows:

Let: $ZX = X_t^{a-1} (1 - X_t)^{b-1}$

FN_t = value of integral for X_t

FN_p = true value of integral

Then:

$$X_{t+1} = X_t - \frac{FN_t - FN_p}{ZX} \quad \text{(Newton's method)}$$

The final attempt for the solution of inverse of the aforementioned integral made use of the following recursion formulas:

$$I_x(a,b) = I_x(a,b-1) + \frac{x^a(1-x)^{b-1}}{(a+b-1)\beta(a,b)}$$

and: $I_x(a,a) = 1/2\ [1 + I_{x'}(1/2,a)]$

$= 1 - 1/2\ I_{1-x'}\ (a,1/2)$

where: $x' = 4(x - 1/2)^2$ or $x = 1/2(1 + \sqrt{x'})$

The technique used to estimate the value of the inverse then became:

Let: FN_p = true value of integral

$FN' = X_n - X_{n-1}$

$FN'' = FN_{x_n} - FN_{x_{n-1}}$ (values of integral for X_n and X_{n-1})

Then: $X_{n+1} = X_n - \left[FN'(IN_{x_n} - FN_p)/FN'' \right]$

The subsequent narrative includes the computer generated tables for a range of distribution parameters "a" and "b". The table is self-explanatory and the values shown therein were compared with those included in K. Pearson's Tables of the Incomplete Beta Function, Cambridge (1956). This comparison indicated the computer generated table was within all significant digits of those of Pearson's Tables.

SUBROUTINE BETAX

This subroutine is the electronic computer application for the solution of the beta distribution function and its inverse.

The entry for the solution of the inverse is labeled BETAX1.

The arguments for entry are labeled as follows:

A = value of a

B = value of b

XR = value of x

BETA = value of distribution function
and true value for the inverse
computation

XC = value of the inverse

The label CONGAM is the title of the computer function for the solution of the complete gamma function. This function (subroutine type) will be discussed in a subsequent portion of this narrative which concerns the subroutines required for the electronic computer application for the solution of the incomplete gamma function.

All other labels included in the BETAX subroutine are self-explanatory.

```
      PROGRAM DRIVER(INPUT,OUTPUT,FIN,FOU,TAPE5=FIN,TAPE6=FOU)
      COMMON/UNITS/IW,IR
      COMMON/VARBLS/FX,XAB,FOFX
      IW=6 $ IR=5
 5    A=0.0 $ B=0.5 $ LINE=0
   10 A = A+ 5.E-1
   12 IF(A.GT.9.0) GO TO 100
      X=0.0
      IF(LINE.NE.0) GO TO 17
10    WRITE(IW,15)
   15 FORMAT(1H1,///23X*INCOMPLETE BETA FUNCTION AND INVERSE*)
   17 WRITE(IW,19)A,B
   19 FORMAT(/23X*A = *F5.1* AND B = *F5.1/25X*X*5X*BETA(X)*
     1  5X*INVERSE XC*2X*ERROR TERM*)
15    DO 25 K=1,25
      X = X + 4.E-2 $ IF(K.EQ.25) X=1.0
      CALL BETAX(A,B,X,BETA,XC)
      BETA1=BETA
      CALL BETAX1(A,B,X,BETA,XC)
20    DIFF=X-XC
      IF(XC.EQ.99.) GO TO 21
      WRITE(IW,20)X,BETA1,XC,DIFF
   20 FORMAT(20X,F6.2,3(2X,F10.7))
      GO TO 25
25    21 WRITE(IW,22)X,BETA1
   22 FORMAT(20X,F6.2,2X,F10.7,2(1X*NOT DEFINED*))
   25 CONTINUE
      LINE=LINE+1 $ IF(LINE.EQ.2)LINE=0
      GO TO 10
30    100 IF ( B . GT. 5. ) GO TO 200
      B = B + 0.5
      A = B
      GO TO 12
   200 CALL EXIT
35    END
```


SYMBOLIC REFERENCE MAP (R=1)

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
10214 DRIVER

VARIABLES	SN	TYPE	RELOCATION						
10366	A	REAL		10367	B	REAL			
10373	BETA	REAL		10375	BETA1	REAL			
10376	DIFF	REAL		2	FOFX	REAL	VARBLS		
0	FX	REAL	VARBLS	1	IR	INTEGER	UNITS		
0	IW	INTEGER	UNITS	10372	K	INTEGER			
10370	LINE	INTEGER		10371	X	REAL			
1	XAB	REAL	VARBLS	10374	XC	REAL			

FILE NAMES	MODE						
4102	FIN	6143	FOU	0	INPUT	2041	OUTPUT
4102	TAPE5	6143	TAPE6				

EXTERNALS	TYPE	ARGS		
BETAX		5	BETAX1	5
EXIT		0		

STATEMENT LABELS

10222	10	10224	12		10306	15	FMT	
10232	17	10322	19	FMT	10343	20	FMT	
10255	21	10353	22	FMT	10257	25		
10266	100	10273	200					

COMMON BLOCKS	LENGTH
UNITS	2
VARBLS	3

STATISTICS		
PROGRAM LENGTH	1738	123
BUFFER LENGTH	102048	4228
CM LABELED COMMON LENGTH	58	5

```
      SUBROUTINE BETAX(A,B,XR,BETA,XC)
      COMMON/UNITS/IW,IR
      COMMON/VARBLS/FX,XAB,FOFX
      X=XR
      ASSIGN 2000 TO ISX
   10 IOW=0 $ XA=X $ IF(A.NE.B) GO TO 12
      IOW=1 $ BZ=0.5 $ TZ=BZ $ MAX=0
      XA=XA-0.5 $ XA=4.0*XA*XA $ XA=1.0-XA
      GO TO 15
   12 NP=B $ BP=NP $ BZ=B-BP $ TZ=BZ
      MAX=NP  $ IF(BZ.GT.1.0E-10) GO TO 15
      MAX=MAX-1 $ BZ=1.0 $ TZ=1.0
   15 IF(XA.GT.0.5) GO TO 30
      AB=A $ BC=BZ $ ISW=0
      GO TO 50
   30 AB=BZ $ BC=A $ XA=1.0-XA $ ISW=1
   50 GX=AB $ FACTN=1.0 $ FOFX=1.0 $ BETAM=1.0
      DO 60 K=1,60
      BK=K $ FACTN=FACTN*BK $ BD=BK-BC
      GX=GX*XA*BD $ FX=GX/((AB+BK)*FACTN)
      FOFX=FOFX+FX $ IF(ABS(FX).LT.1.0E-10) GO TO 90
   60 CONTINUE
      PRINT 70
   70 FORMAT(1X*NO CONVERGENCE FOUND FOR FX - ABORTED*)
      CALL EXIT
   90 XM=ABS(XA) $ BETAM=XM**AB/AB $ ARGA=AB+BC
      XAB=CONGAM(ARGA)/(CONGAM(AB)*CONGAM(BC))
      BETAM=XAB*BETAM*FOFX $ IF(ISW.EQ.1)BETAM=1.0-BETAM
      IF(BETAM.LE.1.0E-14) BETAM=0.0
      IF(MAX.NE.0) GO TO 100
      GO TO 150
  100 XAP=X**A $ CONA=CONGAM(A)
      DO 110 K=1,MAX
      CK=K $ CKK=CK+TZ $ ARGA=A+CKK $ CONB=CONGAM(CKK)
      XAB=CONGAM(ARGA)/(CONA*CONB) $ XAB=1.0-X $ CKK=CKK-1.0
      XAB=XAB**CKK $ XAC=A+CKK $ BETAM=BETAM+(XAP*XAB*XAB/XAC)
   95 FORMAT(1X*XAB = *F8.6,2X*XAC =*F8.6,2X*XAP = *F8.6
     1  /1X*XAB = *F15.6)
  110 CONTINUE
  120 FORMAT(1X*MAX = *I4,5X*X = *F15.7,5X*BZ = *F15.7
     1  /1X*A = *F15.7,2X*B = *F15.7,2X*BETA = *F15.7)
  150 BETA=BETAM $ IF(IOW.NE.1) GO TO 160
      BETA=1.0-(0.5*BETAM) $ IF(X.LT.0.5)BETA=1.0-BETA
  160 GO TO ISX(2000,250,300,310)
      ENTRY BETAX1
      X=1.0 $ IF(BETA.EQ.1.0) GO TO 450
      X=1.0-1.0E-5 $ NC=0 $ TEST=BETA $ SAVE=X
      IF(BETA.GT.1.0E-7) GO TO 200
      X=99. $ GO TO 450
  200 ASSIGN 250 TO ISX $ GO TO 10
  250 IF(NC.GT.0) GO TO 300
      IF(BETA.LT.TEST) GO TO 280
      IF(BETA.EQ.TEST) GO TO 450
      SAVE=X $ X=X-1.0E-1 $ IF(X.LE.0.0) GO TO 280
      SAVE=X $ GO TO 200
  280 X=X1=SAVE $ ASSIGN 300 TO ISX $ GO TO 10
  300 FX1=BETA $ X=X2=X1-1.0E-7
```



```
  305 ASSIGN 310 TO ISX $ GO TO 10
  310 FX2=BETA $ DX=X2-X1 $ DXDF=FX2-FX1
```

```
                305  ASSIGN 310 TO ISX $ GO TO 10
                310  FX2=BETA $ DX=X2-X1 $ DXDP=FX2-FX1
     60               IF(DXDP.EQ.0.0) GO TO 450
                      X3=X2-(DX*(FX2-TEST)/DXDP) $ ERROR = X3-X2
                      IF(ABS(ERROR).LT.1.0E-7) GO TO 450
                      X1=X2 $ X=X2=X3 $ NC=NC+1 $ FX1=FX2
                      IF(X2.GT.X1*3.0)X=X2=3.0*X1
     65               IF(NC.LE.100) GO TO 305
                450  XC=X $ GO TO 2000
               2000  RETURN
                      END
```

SYMBOLIC REFERENCE MAP (P=1)

ENTRY POINTS
3 BETAX 206 BETAX1

VARIABLES	SN	TYPE	RELOCATION				
0	A	REAL	F.P.	402	AB	REAL	
414	APSA	REAL		0	B	REAL	F.P.
403	BC	REAL		412	BD	REAL	
0	BETA	REAL	F.P.	407	BETAM	REAL	
411	BK	REAL		401	BP	REAL	
375	BZ	REAL		417	CK	REAL	
420	CKK	REAL		416	CONA	REAL	
421	CONB	REAL		433	DX	REAL	
434	DXDP	REAL		436	ERROR	REAL	
406	FACTN	REAL		2	FOFX	REAL	VARBLS
0	FX	REAL	VARBLS	430	FX1	REAL	
432	FX2	REAL		405	GX	REAL	
373	IGW	INTEGER		1	IR	INTEGER	UNITS
404	ISW	INTEGER		372	ISX	INTEGER	
0	IW	INTEGER	UNITS	410	K	INTEGER	
377	MAX	INTEGER		424	NC	INTEGER	
400	NP	INTEGER		426	SAVE	REAL	
425	TEST	REAL		376	TZ	REAL	
371	X	REAL		374	XA	REAL	
1	XAB	REAL	VARBLS	423	XAC	REAL	
415	XAP	REAL		422	XAQ	REAL	
0	XC	REAL	F.P.	413	XM	REAL	
0	XR	REAL	F.P.	427	X1	REAL	
431	X2	REAL		435	X3	REAL	

FILE NAMES MODE
OUTPUT FMT

EXTERNALS	TYPE	ARGS			
CONGAM	REAL	1	EXIT	0	

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS

11	10		25	12		37	15		
45	30		53	50		0	60		
324	70	FMT	103	90		332	95	FMT	NO REFS
134	100		0	110		342	120	FMT	NO REFS
173	150		203	160		227	200		
231	250		243	280		247	300		
253	305		255	310		302	450		
304	2000								

COMMON BLOCKS	LENGTH
UNITS	2
VARBLS	3

STATISTICS

PROGRAM LENGTH	4378	287
CM LABELED COMMON LENGTH	58	5


```
      FUNCTION CONGAM  (ALF )
      COMMON/UNITS/IW,IR
      DIMENSION   BC (A)
```

```
      FUNCTION CONGAM  (ALF )
      COMMON/UNITS/IW,IR
      DIMENSION   BC (8)
      DATA((BC (K) , K = 1,8 ) =   -0.577191652 , 0.988205891 ,
     1   -0.897056937  , 0.918206857 ,  - 0.756704078  , 0.482199394,
     2     -0.193527818  ,   0.035868343    )
      PI = 3.14159265358979
      KSW = 1
      CONGAM = 0.0
      IF ( ALF . GT. 1. E-10  )  GO TO 1
      IF ( ALF . LT. 1. E-10  )  GO TO 5
      CONGAM = 1.0
      GO TO 100
    5 NCP = ALF
      SAVE = ALF
      ALF1 = ABS (NCP)
      COMP = 0.0
      COMP = ALF + ALF1
      IF ( ABS (COMP) .GT. 1.E-10 )    GO TO 15
      PRINT 10
   10 FORMAT ( 8X,  28HALPHA IS A NEGATIVE INTEGER   )
      GO TO 100
   15 KSW = 2
      ALF = 1.0 - ALF
      IF ( ALF . GT. 1.E-10  )  GO TO 1
      PRINT 18
   18 FORMAT ( 8X, 30HBAD EQUATION IN TERMS OF ALPHA   )
      CALL EXIT
   19 ALF = SAVE
      CONGAM = PI / ( CONGAM * SIN ( PI * ALF) )
      GO TO 100
    1 MARK = 1
      FB = 1.0
      N = ALF
      COMP = 0.0
      COMP=ALF+1.0E-10
      N = COMP
CK DO(" C:    8 FORMAT ( 8X, I4 , 8X, E19.12 )
      KN = N - 1
      IF (KN.GE.1)  GO TO 20
      IF ( ALF .LT. 1.0 )  GO TO 9
      X = ALF - 1.0
      GO TO 40
    9 MARK = 2
      X = ALF
      GO TO 40
   20 DO 30  K = 1, KN
      FK = K
      FA = 0.0
      FA = ALF - FK
      FB = FB * FA
   30 CONTINUE
      X = FA - 1.0
      TEST = ABS (X)
      IF (TEST.GE.1.E-8)  GO TO 40
      FOFX = 1.0
      GO TO 60
```

```
                40 JB = 8
                   FOFX = 0.0
60              50 FOFX = FOFX + BC(JB)
                   FOFX = FOFX * X
                   JB = JB - 1
                   IF (JB.GT.0)  GO TO 50
                   FOFX = FOFX + 1.0
65              60 CONGAM = FOFX * FB
                   IF (MARK .EQ. 2 ) CONGAM = CONGAM / X
                   IF ( KSW .EQ. 2 )  GO TO 19
               100 RETURN
                   END
```


CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

BASIC EXTERNAL OR INTRINSIC FUNCTION CALLED WITH WRONG TYPE ARGUMENT.

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

16 I BASIC EXTERNAL OR INTRINSIC FUNCTION CALLED WITH WRONG TYPE ARGUMENT.

SYMBOLIC REFERENCE MAP (R=1)

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 CONGAM

VARIABLES	SN	TYPE	RELOCATION		VARIABLES	SN	TYPE	RELOCATION
0	ALF	REAL	F.P.		160	ALF1	REAL	
175	BC	REAL ARRAY			161	COMP	REAL	
153	CONGAM	REAL			171	FA	REAL	
163	FB	REAL			170	FK	REAL	
173	FOFX	REAL			1	IR	INTEGER	UNITS
0	IW	INTEGER	UNITS		174	JB	INTEGER	
167	K	INTEGER			165	KN	INTEGER	
155	KSW	INTEGER			162	MARK	INTEGER	
164	N	INTEGER			156	NCP	INTEGER	
154	PI	REAL			157	SAVE	REAL	
172	TEST	REAL			166	X	REAL	

FILE NAMES MODE
OUTPUT FMT

EXTERNALS	TYPE	ARGS			
EXIT		0	SIN	REAL	1 LIBRARY

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS

45	1		16	5		62	9		
132	10	FMT	30	15		142	18	FMT	
37	19		65	20		0	30		
105	40		107	50		116	60		
126	100								

COMMON BLOCKS	LENGTH
UNITS	2

STATISTICS

PROGRAM LENGTH	2058	133
CM LABELED COMMON LENGTH	28	2

INCOMPLETE BETA FUNCTION AND INVERSE

A = .5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.1281884	.0400000	-.0000000
.08	.1825549	.0800000	.0000000
.12	.2251989	.1200000	.0000000
.16	.2619798	.1600000	.0000000
.20	.2951673	.2000000	.0000000
.24	.3259320	.2400000	.0000000
.28	.3549785	.2800000	.0000000
.32	.3827767	.3200000	.0000000
.36	.4096655	.3600000	.0000000
.40	.4359058	.4000000	.0000000
.44	.4617105	.4400000	.0000000
.48	.4872642	.4800000	.0000000
.52	.5127358	.5200000	-.0000000
.56	.5382895	.5600000	.0000000
.60	.5640942	.6000000	-.0000000
.64	.5903345	.6400000	.0000000
.68	.6172233	.6800000	.0000000
.72	.6450215	.7200000	.0000000
.76	.6740660	.7600000	-.0000000
.80	.7048327	.8000000	-.0000000
.84	.7380202	.8400000	-.0000000
.88	.7748011	.8800000	-.0000000
.92	.8174451	.9200000	-.0000000
.96	.8718116	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 1.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0202041	.0400000	-.0000000
.08	.0408337	.0800000	-.0000000
.12	.0619168	.1200000	.0000000
.16	.0834849	.1600000	.0000000
.20	.1055728	.2000000	-.0000000
.24	.1282202	.2400000	.0000000
.28	.1514719	.2800000	.0000000
.32	.1753789	.3200000	.0000000
.36	.2000000	.3600000	.0000000
.40	.2254033	.4000000	-.0000000
.44	.2516685	.4400000	.0000000
.48	.2788897	.4800000	-.0000000
.52	.3071797	.5200000	.0000000
.56	.3366750	.5599999	.0000001
.60	.3675445	.6000000	-.0000000
.64	.4000000	.6400000	.0000000
.68	.4343146	.6800000	-.0000000
.72	.4708497	.7200000	.0000000
.76	.5101021	.7600000	-.0000000
.80	.5527864	.8000000	-.0000000
.84	.6000000	.8400000	-.0000000
.88	.6535898	.8800000	.0000000
.92	.7171573	.9200000	-.0000000
.96	.8000000	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 1.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0034369	.0400000	-.0000000
.08	.0098443	.0800000	-.0000000
.12	.0183220	.1200000	-.0000000
.16	.0285911	.1600000	-.0000000
.20	.0405193	.2000000	-.0000000
.24	.0540424	.2400000	-.0000000
.28	.0691369	.2800000	-.0000000
.32	.0858087	.3200000	.0000000
.36	.1040880	.3600000	-.0000000
.40	.1240270	.4000000	-.0000000
.44	.1457008	.4400000	-.0000000
.48	.1692090	.4800000	-.0000000
.52	.1946808	.5200000	.0000000
.56	.2222798	.5600000	-.0000000
.60	.2522156	.6000000	-.0000000
.64	.2847571	.6400000	-.0000000
.68	.3202555	.6800000	-.0000000
.72	.3591801	.7200000	.0000000
.76	.4021786	.7600000	-.0000000
.80	.4501849	.8000000	-.0000000
.84	.5046317	.8400000	-.0000000
.88	.5679242	.8800000	.0000000
.92	.6447346	.9200000	-.0000000
.96	.7470601	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 2.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0006082	.0400000	-.0000000
.08	.0024670	.0800000	-.0000000
.12	.0056319	.1200000	-.0000000
.16	.0101636	.1600000	.0000000
.20	.0161301	.2000000	-.0000000
.24	.0236066	.2400000	-.0000000
.28	.0326779	.2800000	.0000000
.32	.0434395	.3199999	.0000001
.36	.0560000	.3600000	-.0000000
.40	.0704840	.4000000	-.0000000
.44	.0870356	.4400000	-.0000000
.48	.1058233	.4800001	-.0000001
.52	.1270464	.5200000	.0000000
.56	.1509441	.5600000	-.0000000
.60	.1778078	.6000000	-.0000000
.64	.2080000	.6400000	-.0000000
.68	.2419815	.6800000	-.0000000
.72	.2803556	.7200000	.0000000
.76	.3239408	.7600000	-.0000000
.80	.3739010	.8000000	-.0000000
.84	.4320000	.8400000	-.0000000
.88	.5011694	.8800000	.0000000
.92	.5870496	.9200000	-.0000000
.96	.7040000	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 2.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0001102	.0400000	-.0000000
.08	.0006330	.0800001	-.0000001
.12	.0017718	.1200000	-.0000000
.16	.0036963	.1600000	.0000000
.20	.0065663	.2000000	-.0000000
.24	.0105400	.2400001	-.0000001
.28	.0157798	.2800000	.0000000
.32	.0224556	.3200000	-.0000000
.36	.0307494	.3600000	.0000000
.40	.0408594	.4000000	-.0000000
.44	.0530046	.4400000	-.0000000
.48	.0674314	.4800000	.0000000
.52	.0844217	.5199999	.0000001
.56	.1043029	.5600000	-.0000000
.60	.1274641	.6000000	-.0000000
.64	.1543774	.6400000	-.0000000
.68	.1856300	.6800000	.0000000
.72	.2219762	.7200000	.0000000
.76	.2644212	.7600000	-.0000000
.80	.3143727	.8000000	-.0000000
.84	.3739340	.8400000	-.0000000
.88	.4465564	.8800000	.0000000
.92	.5388054	.9200000	-.0000000
.96	.6672192	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000203	.0400000	-.0000000
.08	.0001650	.0800000	-.0000000
.12	.0005662	.1200000	.0000000
.16	.0013651	.1599999	.0000001
.20	.0027137	.2000000	-.0000000
.24	.0047762	.2400000	.0000000
.28	.0077312	.2800000	.0000000
.32	.0117740	.3200000	-.0000000
.36	.0171200	.3600000	.0000000
.40	.0240082	.4000000	-.0000000
.44	.0327067	.4400000	-.0000000
.48	.0435194	.4800000	.0000000
.52	.0567944	.5200000	-.0000000
.56	.0729370	.5600000	.0000000
.60	.0924263	.6000000	-.0000000
.64	.1158400	.6400000	-.0000000
.68	.1438917	.6800000	.0000000
.72	.1774888	.7199999	.0000001
.76	.2178289	.7600001	-.0000001
.80	.2665697	.8000000	-.0000000
.84	.3261600	.8400000	-.0000000
.88	.4005719	.8800000	.0000000
.92	.4972754	.9200000	-.0000000
.96	.6348800	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000038	.0400000	-.0000000
.08	.0000435	.0800000	-.0000000
.12	.0001830	.1200000	.0000000
.16	.0005098	.1600000	-.0000000
.20	.0011338	.2000000	-.0000000
.24	.0021876	.2400000	.0000000
.28	.0038278	.2800000	.0000000
.32	.0062372	.3200000	-.0000000
.36	.0096279	.3600000	.0000000
.40	.0142458	.4000000	-.0000000
.44	.0203755	.4400000	-.0000000
.48	.0283488	.4800000	.0000000
.52	.0385539	.5200000	-.0000000
.56	.0514492	.5600000	.0000000
.60	.0675834	.6000000	-.0000000
.64	.0876230	.6400000	-.0000000
.68	.1123938	.6800000	.0000000
.72	.1429467	.7200000	-.0000000
.76	.1806648	.7600000	.0000000
.80	.2274529	.8000000	-.0000000
.84	.2861052	.8400000	-.0000000
.88	.3611135	.8800000	.0000000
.92	.4608415	.9200000	-.0000000
.96	.6059013	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 4.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000007	.0400000	-.0000000
.08	.0000116	.0800000	-.0000000
.12	.0000596	.1200000	.0000000
.16	.0001920	.1600000	.0000000
.20	.0004776	.2000000	-.0000000
.24	.0010101	.2400000	.0000000
.28	.0019103	.2800000	-.0000000
.32	.0033299	.3200000	-.0000000
.36	.0054560	.3599999	.0000001
.40	.0085163	.4000000	-.0000000
.44	.0127861	.4400000	.0000000
.48	.0185978	.4800000	.0000000
.52	.0263519	.5200000	-.0000000
.56	.0365338	.5600000	.0000000
.60	.0497356	.6000000	-.0000000
.64	.0666880	.6400000	-.0000000
.68	.0883074	.6800000	.0000000
.72	.1157687	.7200000	-.0000000
.76	.1506247	.7600000	.0000000
.80	.1950155	.8000000	-.0000000
.84	.2520720	.8400000	-.0000000
.88	.3268003	.8799999	.0000001
.92	.4284484	.9200000	-.0000000
.96	.5795840	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	.0400000	-.0000000
.08	.0000031	.0800001	-.0000001
.12	.0000196	.1199999	.0000001
.16	.0000728	.1599999	.0000001
.20	.0002025	.2000000	-.0000000
.24	.0004694	.2400000	.0000000
.28	.0009593	.2800000	.0000000
.32	.0017887	.3200000	-.0000000
.36	.0031104	.3600000	.0000000
.40	.0051211	.4000000	-.0000000
.44	.0080697	.4400000	.0000000
.48	.0122691	.4800000	.0000000
.52	.0181100	.5200000	-.0000000
.56	.0260794	.5600000	.0000000
.60	.0367877	.6000000	-.0000000
.64	.0510034	.6400001	-.0000001
.68	.0697075	.6800000	.0000000
.72	.0941742	.7200000	-.0000000
.76	.1261034	.7600000	.0000000
.80	.1678508	.8000000	-.0000000
.84	.2228685	.8400001	-.0000001
.88	.2966651	.8800000	.0000000
.92	.3993615	.9200000	-.0000000
.96	.5554455	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000008	.0800000	-.0000000
.12	.0000065	.1200000	.0000000
.16	.0000277	.1600000	.0000000
.20	.0000863	.2000000	-.0000000
.24	.0002192	.2400000	.0000000
.28	.0004842	.2800000	.0000000
.32	.0009656	.3200000	-.0000000
.36	.0017818	.3600000	.0000000
.40	.0030941	.4000000	-.0000000
.44	.0051167	.4400000	.0000000
.48	.0081307	.4800000	.0000000
.52	.0125005	.5200000	-.0000000
.56	.0186962	.5600000	.0000000
.60	.0273229	.6000000	-.0000000
.64	.0391629	.6400000	.0000000
.68	.0552348	.6800000	.0000000
.72	.0768851	.7200000	-.0000000
.76	.1059339	.7600000	.0000000
.80	.1449276	.8000000	-.0000000
.84	.1976173	.8400000	.0000000
.88	.2699963	.8800000	.0000000
.92	.3730427	.9200000	-.0000000
.96	.5331354	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800000	-.0000000
.12	.0000021	.1200000	.0000000
.16	.0000106	.1600000	-.0000000
.20	.0000369	.2000000	-.0000000
.24	.0001028	.2400000	.0000000
.28	.0002454	.2800000	.0000000
.32	.0005234	.3200001	-.0000001
.36	.0010248	.3600000	.0000000
.40	.0018767	.4000000	-.0000000
.44	.0032568	.4400000	.0000000
.48	.0054084	.4799999	.0000001
.52	.0086603	.5200000	-.0000000
.56	.0134509	.5600000	.0000000
.60	.0203632	.6000000	-.0000000
.64	.0301709	.6400000	.0000000
.68	.0439060	.6800000	.0000000
.72	.0629598	.7200000	-.0000000
.76	.0892442	.7600000	.0000000
.80	.1254670	.8000000	-.0000000
.84	.1756517	.8400000	.0000000
.88	.2462522	.8800000	.0000000
.92	.3490844	.9200000	-.0000000
.96	.5123899	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000007	.1200000	.0000000
.16	.0000041	.1600000	-.0000000
.20	.0000159	.2000000	-.0000000
.24	.0000484	.2399999	.0000001
.28	.0001248	.2800000	-.0000000
.32	.0002846	.3200000	.0000000
.36	.0005914	.3600000	-.0000000
.40	.0011421	.4000000	-.0000000
.44	.0020796	.4400000	.0000000
.48	.0036090	.4800000	-.0000000
.52	.0060181	.5200000	-.0000000
.56	.0097060	.5600000	.0000000
.60	.0152201	.6000000	-.0000000
.64	.0233084	.6400000	.0000000
.68	.0349944	.6800000	.0000000
.72	.0516885	.7200000	-.0000000
.76	.0753654	.7600000	.0000000
.80	.1088643	.8000000	-.0000000
.84	.1564496	.8400000	.0000000
.88	.2250075	.8800000	.0000000
.92	.3271668	.9200000	-.0000000
.96	.4930037	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000002	.1200000	-.0000000
.16	.0000016	.1600000	.0000000
.20	.0000068	.2000000	-.0000000
.24	.0000228	.2400000	-.0000000
.28	.0000636	.2800000	.0000000
.32	.0001553	.3200000	.0000000
.36	.0003423	.3600000	-.0000000
.40	.0006970	.4000000	-.0000000
.44	.0013316	.4400000	.0000000
.48	.0024147	.4800000	-.0000000
.52	.0041932	.5200000	-.0000000
.56	.0070219	.5600000	.0000000
.60	.0114045	.6000000	-.0000000
.64	.0180502	.6400000	.0000000
.68	.0279560	.6800000	.0000000
.72	.0425286	.7200000	-.0000000
.76	.0637778	.7600000	.0000000
.80	.0946425	.8000000	-.0000000
.84	.1395953	.8400000	.0000000
.88	.2059218	.8800000	.0000000
.92	.3070345	.9200000	-.0000000
.96	.4748140	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000001	NOT DEFINED	NOT DEFINED
.16	.0000006	.1600000	.0000000
.20	.0000030	.2000000	-.0000000
.24	.0000109	.2400000	-.0000000
.28	.0000325	.2800000	.0000000
.32	.0000849	.3200000	.0000000
.36	.0001986	.3600000	-.0000000
.40	.0004264	.4000000	-.0000000
.44	.0008547	.4399999	.0000001
.48	.0016194	.4800001	-.0000001
.52	.0029281	.5200000	-.0000000
.56	.0050911	.5600000	.0000000
.60	.0085635	.6000000	-.0000000
.64	.0140071	.6400000	.0000000
.68	.0223778	.6800000	.0000000
.72	.0350587	.7200000	-.0000000
.76	.0540694	.7600000	.0000000
.80	.0824179	.8000000	-.0000000
.84	.1247504	.8400000	.0000000
.88	.1887165	.8800000	.0000000
.92	.2884781	.9200000	-.0000000
.96	.4576879	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000002	.1600000	-.0000000
.20	.0000013	.2000000	-.0000000
.24	.0000051	.2400001	-.0000001
.28	.0000167	.2800000	.0000000
.32	.0000465	.3200000	.0000000
.36	.0001155	.3600000	.0000000
.40	.0002614	.4000000	-.0000000
.44	.0005497	.4400000	.0000000
.48	.0010882	.4800000	.0000000
.52	.0020490	.5200000	-.0000000
.56	.0036986	.5600000	.0000000
.60	.0064427	.6000000	-.0000000
.64	.0108897	.6400000	.0000000
.68	.0179443	.6800000	-.0000000
.72	.0289497	.7200000	-.0000000
.76	.0459122	.7600000	.0000000
.80	.0718797	.8000000	-.0000000
.84	.1116377	.8400000	.0000000
.88	.1731612	.8800000	-.0000000
.92	.2713245	.9200000	-.0000000
.96	.4415161	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000001	NOT DEFINED	NOT DEFINED
.20	.0000006	.2000000	-.0000000
.24	.0000024	.2400000	.0000000
.28	.0000086	.2800000	.0000000
.32	.0000255	.3200000	.0000000
.36	.0000672	.3600000	.0000000
.40	.0001605	.4000000	-.0000000
.44	.0003542	.4400000	.0000000
.48	.0007326	.4800000	.0000000
.52	.0014361	.5200000	-.0000000
.56	.0026913	.5600000	.0000000
.60	.0048549	.6000000	-.0000000
.64	.0084795	.6400000	.0000000
.68	.0144114	.6800000	-.0000000
.72	.0239405	.7200000	-.0000000
.76	.0390405	.7600000	.0000000
.80	.0627720	.8000000	-.0000000
.84	.1000251	.8400000	.0000000
.88	.1590616	.8800000	-.0000000
.92	.2554269	.9200000	-.0000000
.96	.4262064	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.5 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000000	NOT DEFINED	NOT DEFINED
.20	.0000002	.2000000	-.0000000
.24	.0000012	.2400000	.0000000
.28	.0000044	.2800000	-.0000000
.32	.0000140	.3200000	.0000000
.36	.0000392	.3600000	.0000000
.40	.0000988	.4000000	-.0000000
.44	.0002286	.4400000	.0000000
.48	.0004940	.4800000	.0000000
.52	.0010084	.5200001	-.0000001
.56	.0019616	.5599999	.0000001
.60	.0036641	.6000000	-.0000000
.64	.0066125	.6400000	.0000000
.68	.0115903	.6800000	-.0000000
.72	.0198247	.7200000	-.0000000
.76	.0332395	.7600000	.0000000
.80	.0548836	.8000000	-.0000000
.84	.0897189	.8400000	.0000000
.88	.1462538	.8800000	-.0000000
.92	.2406614	.9200000	-.0000000
.96	.4116811	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 9.0 AND B = .5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000000	NOT DEFINED	NOT DEFINED
.20	.0000001	.2000000	-.0000000
.24	.0000006	.2400000	.0000000
.28	.0000023	.2800000	.0000000
.32	.0000077	.3200000	.0000000
.36	.0000229	.3600000	.0000000
.40	.0000608	.4000000	-.0000000
.44	.0001477	.4400000	.0000000
.48	.0003335	.4800000	.0000000
.52	.0007088	.5200000	.0000000
.56	.0014314	.5600000	-.0000000
.60	.0027688	.6000000	-.0000000
.64	.0051629	.6400000	.0000000
.68	.0093327	.6800000	-.0000000
.72	.0164358	.7200000	-.0000000
.76	.0283323	.7600000	.0000000
.80	.0480375	.8000000	-.0000000
.84	.0805539	.8400000	.0000000
.88	.1345963	.8800000	-.0000000
.92	.2269203	.9200000	-.0000000
.96	.3978730	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 1.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0400000	.0400000	-.0000000
.08	.0800000	.0800000	-.0000000
.12	.1200000	.1200000	.0000000
.16	.1600000	.1600000	.0000000
.20	.2000000	.2000000	.0000000
.24	.2400000	.2400000	.0000000
.28	.2800000	.2800000	.0000000
.32	.3200000	.3200000	-.0000000
.36	.3600000	.3600000	-.0000000
.40	.4000000	.4000000	-.0000000
.44	.4400000	.4400000	-.0000000
.48	.4800000	.4800000	-.0000000
.52	.5200000	.5200000	-.0000000
.56	.5600000	.5600000	.0000000
.60	.6000000	.6000000	.0000000
.64	.6400000	.6400000	.0000000
.68	.6800000	.6800000	.0000000
.72	.7200000	.7200000	-.0000000
.76	.7600000	.7600000	.0000000
.80	.8000000	.8000000	-.0000000
.84	.8400000	.8400000	.0000000
.88	.8800000	.8800000	-.0000000
.92	.9200000	.9200000	.0000000
.96	.9600000	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 1.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0080000	.0400000	-.0000000
.08	.0226274	.0800000	-.0000000
.12	.0415692	.1199999	.0000001
.16	.0640000	.1600000	-.0000000
.20	.0894427	.2000000	-.0000000
.24	.1175755	.2400000	-.0000000
.28	.1481621	.2800000	-.0000000
.32	.1810193	.3200000	.0000000
.36	.2160000	.3600000	-.0000000
.40	.2529822	.4000000	-.0000000
.44	.2918630	.4400000	.0000000
.48	.3325538	.4800000	-.0000000
.52	.3749773	.5200000	.0000000
.56	.4190656	.5600000	.0000000
.60	.4647580	.6000000	-.0000000
.64	.5120000	.6400000	.0000000
.68	.5607424	.6799999	.0000001
.72	.6109403	.7200000	.0000000
.76	.6625526	.7600000	.0000000
.80	.7155418	.8000000	-.0000000
.84	.7698727	.8400000	.0000000
.88	.8255132	.8800000	.0000000
.92	.8824330	.9200000	.0000000
.96	.9406041-	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 2.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0016000	.0400000	-.0000000
.08	.0064000	.0800000	-.0000000
.12	.0144000	.1200000	-.0000000
.16	.0256000	.1600000	.0000000
.20	.0400000	.2000000	-.0000000
.24	.0576000	.2400000	-.0000000
.28	.0784000	.2800000	.0000000
.32	.1024000	.3200000	.0000000
.36	.1296000	.3600000	-.0000000
.40	.1600000	.4000000	-.0000000
.44	.1936000	.4400000	-.0000000
.48	.2304000	.4800000	-.0000000
.52	.2704000	.5200000	.0000000
.56	.3136000	.5600000	-.0000000
.60	.3600000	.6000000	-.0000000
.64	.4096000	.6400000	.0000000
.68	.4624000	.6800000	-.0000000
.72	.5184000	.7200000	.0000000
.76	.5776000	.7600000	-.0000000
.80	.6400000	.8000000	-.0000000
.84	.7056000	.8400000	.0000000
.88	.7744000	.8800000	-.0000000
.92	.8464000	.9200000	.0000000
.96	.9216000	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 2.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0003200	.0400000	-.0000000
.08	.0018102	.0800001	-.0000001
.12	.0049883	.1200000	-.0000000
.16	.0102400	.1600000	.0000000
.20	.0178885	.2000000	-.0000000
.24	.0282181	.2400000	-.0000000
.28	.0414854	.2800000	.0000000
.32	.0579262	.3200000	-.0000000
.36	.0777600	.3600001	-.0000001
.40	.1011929	.4000000	-.0000000
.44	.1284197	.4400000	-.0000000
.48	.1596258	.4800001	-.0000001
.52	.1949882	.5200000	.0000000
.56	.2346768	.5600000	-.0000000
.60	.2788548	.6000000	-.0000000
.64	.3276800	.6400000	-.0000000
.68	.3813048	.6800000	-.0000000
.72	.4398770	.7200000	.0000000
.76	.5035400	.7600000	-.0000000
.80	.5724334	.8000000	-.0000000
.84	.6466931	.8399999	.0000001
.88	.7264516	.8800000	-.0000000
.92	.8118384	.9200000	.0000000
.96	.9029799	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000640	.0400000	-.0000000
.08	.0005120	.0800000	-.0000000
.12	.0017280	.1200000	.0000000
.16	.0040960	.1600000	.0000000
.20	.0080000	.2000000	-.0000000
.24	.0138240	.2400000	.0000000
.28	.0219520	.2800000	.0000000
.32	.0327680	.3200000	-.0000000
.36	.0466560	.3600000	.0000000
.40	.0640000	.4000000	-.0000000
.44	.0851840	.4400000	-.0000000
.48	.1105920	.4800000	.0000000
.52	.1406080	.5200000	.0000000
.56	.1756160	.5600000	-.0000000
.60	.2160000	.6000000	-.0000000
.64	.2621440	.6400000	-.0000000
.68	.3144320	.6800000	-.0000000
.72	.3732480	.7200000	.0000000
.76	.4389760	.7600000	-.0000000
.80	.5120000	.8000000	-.0000000
.84	.5927040	.8400000	-.0000000
.88	.6814720	.8800000	-.0000000
.92	.7786880	.9200000	.0000000
.96	.8847360	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000128	.0400000	-.0000000
.08	.0001448	.0800000	-.0000000
.12	.0005986	.1200000	.0000000
.16	.0016384	.1600000	-.0000000
.20	.0035777	.2000000	-.0000000
.24	.0067723	.2400000	.0000000
.28	.0116159	.2800000	.0000000
.32	.0185364	.3200000	-.0000000
.36	.0279936	.3600000	.0000000
.40	.0404772	.4000000	-.0000000
.44	.0565047	.4400000	-.0000000
.48	.0766204	.4800000	.0000000
.52	.1013939	.5200000	-.0000000
.56	.1314190	.5600001	-.0000001
.60	.1673129	.6000000	-.0000000
.64	.2097152	.6400000	-.0000000
.68	.2592873	.6800000	.0000000
.72	.3167114	.7200000	.0000000
.76	.3826904	.7600000	-.0000000
.80	.4579467	.8000000	-.0000000
.84	.5432222	.8400000	-.0000000
.88	.6392774	.8800000	-.0000000
.92	.7468913	.9200000	.0000000
.96	.8668607-	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000026	.0400000	-.0000000
.08	.0000410	.0800000	-.0000000
.12	.0002074	.1200000	.0000000
.16	.0006554	.1600000	.0000000
.20	.0016000	.2000000	-.0000000
.24	.0033178	.2400000	.0000000
.28	.0061466	.2800000	-.0000000
.32	.0104858	.3200000	-.0000000
.36	.0167962	.3600000	.0000000
.40	.0256000	.4000000	-.0000000
.44	.0374810	.4400001	-.0000001
.48	.0530842	.4800000	.0000000
.52	.0731162	.5200000	-.0000000
.56	.0983450	.5600000	.0000000
.60	.1296000	.6000000	-.0000000
.64	.1677722	.6400000	-.0000000
.68	.2138138	.6800000	.0000000
.72	.2687386	.7199999	.0000001
.76	.3336218	.7600000	-.0000000
.80	.4096000	.8000000	-.0000000
.84	.4978714	.8400000	-.0000000
.88	.5996954	.8800000	.0000000
.92	.7163930	.9200000	.0000000
.96	.8493466	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 4.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000005	.0400000	-.0000000
.08	.0000116	.0800000	-.0000000
.12	.0000718	.1199999	.0000001
.16	.0002621	.1600000	.0000000
.20	.0007155	.2000000	-.0000000
.24	.0016254	.2400000	.0000000
.28	.0032525	.2800000	-.0000000
.32	.0059316	.3200000	-.0000000
.36	.0100777	.3600000	.0000000
.40	.0161909	.4000000	-.0000000
.44	.0248621	.4400000	.0000000
.48	.0367778	.4800000	.0000000
.52	.0527248	.5200000	-.0000000
.56	.0735946	.5600000	.0000000
.60	.1003877	.6000000	-.0000000
.64	.1342177	.6400000	-.0000000
.68	.1763153	.6800000	.0000000
.72	.2280322	.7200000	-.0000000
.76	.2908447	.7600000	.0000000
.80	.3663574	.8000000	-.0000000
.84	.4563066	.8400000	-.0000000
.88	.5625641	.8800000	.0000000
.92	.6871400	.9200000	.0000000
.96	.8321863	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	.0400000	-.0000000
.08	.0000033	.0800000	-.0000000
.12	.0000249	.1200000	.0000000
.16	.0001049	.1600000	.0000000
.20	.0003200	.2000000	-.0000000
.24	.0007963	.2400000	.0000000
.28	.0017210	.2800000	.0000000
.32	.0033554	.3200000	-.0000000
.36	.0060466	.3600000	.0000000
.40	.0102400	.4000000	-.0000000
.44	.0164916	.4400000	.0000000
.48	.0254804	.4800000	.0000000
.52	.0380204	.5200000	-.0000000
.56	.0550732	.5600000	.0000000
.60	.0777600	.6000000	-.0000000
.64	.1073742	.6400000	-.0000000
.68	.1453934	.6800000	.0000000
.72	.1934918	.7200000	-.0000000
.76	.2535525	.7600000	.0000000
.80	.3276800	.8000000	-.0000000
.84	.4182119	.8400000	-.0000000
.88	.5277319	.8800000	.0000000
.92	.6590815	.9199999	.0000001
.96	.8153727	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000009	.0800000	-.0000000
.12	.0000086	.1200000	.0000000
.16	.0000419	.1600000	-.0000000
.20	.0001431	.2000000	-.0000000
.24	.0003901	.2400000	.0000000
.28	.0009107	.2800000	.0000000
.32	.0018981	.3200000	-.0000000
.36	.0036280	.3600000	.0000000
.40	.0064763	.4000000	-.0000000
.44	.0109393	.4400000	.0000000
.48	.0176533	.4800000	.0000000
.52	.0274169	.5200000	-.0000000
.56	.0412130	.5600000	.0000000
.60	.0602326	.6000000	-.0000000
.64	.0858993	.6400001	-.0000001
.68	.1198944	.6800000	.0000000
.72	.1641832	.7200000	-.0000000
.76	.2210420	.7600000	.0000000
.80	.2930859	.8000000	-.0000000
.84	.3832976	.8400000	-.0000000
.88	.4950564	.8800000	.0000000
.92	.6321688	.9200000	-.0000000
.96	.7988988	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000003	.0800000	-.0000000
.12	.0000030	.1200000	.0000000
.16	.0000168	.1600000	.0000000
.20	.0000640	.2000000	-.0000000
.24	.0001911	.2400000	.0000000
.28	.0004819	.2800000	-.0000000
.32	.0010737	.3200001	-.0000001
.36	.0021768	.3599999	.0000001
.40	.0040960	.4000000	-.0000000
.44	.0072563	.4400000	.0000000
.48	.0122306	.4799999	.0000001
.52	.0197706	.5200000	-.0000000
.56	.0308410	.5600000	.0000000
.60	.0466560	.6000000	-.0000000
.64	.0687195	.6400000	.0000000
.68	.0988675	.6800000	.0000000
.72	.1393141	.7200000	-.0000000
.76	.1926999	.7600000	.0000000
.80	.2621440	.8000000	-.0000000
.84	.3512980	.8400000	-.0000000
.88	.4644041	.8800000	.0000000
.92	.6063550	.9200000	-.0000000
.96	.7827578	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000010	.1200000	-.0000000
.16	.0000067	.1600000	-.0000000
.20	.0000286	.2000000	-.0000000
.24	.0000936	.2400000	-.0000000
.28	.0002550	.2800000	.0000000
.32	.0006074	.3200000	.0000000
.36	.0013061	.3600000	-.0000000
.40	.0025905	.4000000	-.0000000
.44	.0048133	.4400000	.0000000
.48	.0084736	.4800000	-.0000000
.52	.0142568	.5200000	-.0000000
.56	.0230793	.5600000	.0000000
.60	.0361396	.6000000	-.0000000
.64	.0549756	.6400000	.0000000
.68	.0815282	.6800000	.0000000
.72	.1182119	.7200000	-.0000000
.76	.1679919	.7600000	.0000000
.80	.2344687	.8000000	-.0000000
.84	.3219700	.8400000	-.0000000
.88	.4356496	.8800000	.0000000
.92	.5815953	.9200000	-.0000000
.96	.7669429	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000004	.1200000	-.0000000
.16	.0000027	.1600000	-.0000000
.20	.0000128	.2000000	-.0000000
.24	.0000459	.2400000	-.0000000
.28	.0001349	.2800000	-.0000000
.32	.0003436	.3200000	.0000000
.36	.0007836	.3600000	-.0000000
.40	.0016384	.4000000	-.0000000
.44	.0031928	.4400000	.0000000
.48	.0058707	.4800000	-.0000000
.52	.0102807	.5200000	-.0000000
.56	.0172709	.5600000	.0000000
.60	.0279936	.6000000	-.0000000
.64	.0439805	.6400000	.0000000
.68	.0672299	.6800000	.0000000
.72	.1003061	.7200000	-.0000000
.76	.1464519	.7600000	.0000000
.80	.2097152	.8000000	-.0000000
.84	.2950903	.8400001	-.0000001
.88	.4086756	.8799999	.0000001
.92	.5578466	.9200000	-.0000000
.96	.7514475	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000001	.1200000	-.0000000
.16	.0000011	.1600000	-.0000000
.20	.0000057	.2000000	-.0000000
.24	.0000225	.2400000	-.0000000
.28	.0000714	.2800000	-.0000000
.32	.0001944	.3200000	.0000000
.36	.0004702	.3600001	-.0000001
.40	.0010362	.4000000	-.0000000
.44	.0021178	.4399999	.0000001
.48	.0040673	.4800001	-.0000001
.52	.0074135	.5200000	-.0000000
.56	.0129244	.5600000	.0000000
.60	.0216837	.6000000	-.0000000
.64	.0351844	.6400000	.0000000
.68	.0554392	.6800000	.0000000
.72	.0851126	.7200000	-.0000000
.76	.1276738	.7600000	.0000000
.80	.1875750	.8000000	-.0000000
.84	.2704548	.8400000	.0000000
.88	.3833717	.8800000	.0000000
.92	.5350677	.9200000	-.0000000
.96	.7362652	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000004	.1600000	.0000000
.20	.0000026	.2000000	-.0000000
.24	.0000110	.2400000	.0000000
.28	.0000378	.2800000	.0000000
.32	.0001100	.3200000	.0000000
.36	.0002821	.3600000	.0000000
.40	.0006554	.4000000	-.0000000
.44	.0014048	.4400000	.0000000
.48	.0028179	.4800000	.0000000
.52	.0053460	.5200000	-.0000000
.56	.0096717	.5600000	.0000000
.60	.0167962	.6000000	-.0000000
.64	.0281475	.6400000	.0000000
.68	.0457163	.6800000	.0000000
.72	.0722204	.7200000	-.0000000
.76	.1113035	.7600000	.0000000
.80	.1677722	.8000000	-.0000000
.84	.2478759	.8400000	.0000000
.88	.3596345	.8800000	.0000000
.92	.5132189	.9200000	-.0000000
.96	.7213896	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000002	.1599999	.0000001
.20	.0000011	.2000000	-.0000000
.24	.0000054	.2400000	.0000000
.28	.0000200	.2799999	.0000001
.32	.0000622	.3200000	.0000000
.36	.0001693	.3600000	.0000000
.40	.0004145	.4000000	-.0000000
.44	.0009319	.4400000	.0000000
.48	.0019523	.4800000	.0000000
.52	.0038550	.5200000	-.0000000
.56	.0072377	.5600000	.0000000
.60	.0130102	.6000000	-.0000000
.64	.0225180	.6400000	.0000000
.68	.0376986	.6800000	-.0000000
.72	.0612811	.7200000	-.0000000
.76	.0970321	.7600000	.0000000
.80	.1500600	.8000000	-.0000000
.84	.2271820	.8400000	.0000000
.88	.3373671	.8800000	.0000000
.92	.4922623	.9200000	-.0000000
.96	.7068145	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 1.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000001	NOT DEFINED	NOT DEFINED
.20	.0000005	.2000000	-.0000000
.24	.0000026	.2400000	.0000000
.28	.0000106	.2800000	.0000000
.32	.0000352	.3200000	.0000000
.36	.0001016	.3600000	.0000000
.40	.0002621	.4000000	-.0000000
.44	.0006181	.4400000	.0000000
.48	.0013526	.4800000	.0000000
.52	.0027799	.5200001	-.0000001
.56	.0054162	.5599999	.0000001
.60	.0100777	.6000000	-.0000000
.64	.0180144	.6400000	.0000000
.68	.0310871	.6800000	-.0000000
.72	.0519987	.7200000	-.0000000
.76	.0845906	.7600000	.0000000
.80	.1342177	.8000000	-.0000000
.84	.2082157	.8400000	.0000000
.88	.3164784	.8800000	.0000000
.92	.4721614	.9200000	-.0000000
.96	.6925340	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 1.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0134171	.0400000	-.0000000
.08	.0374780	.0800000	-.0000000
.12	.0679724	.1199999	.0000001
.16	.1032755	.1600000	-.0000000
.20	.1423785	.2000000	-.0000000
.24	.1845494	.2400000	.0000000
.28	.2292082	.2800000	-.0000000
.32	.2758683	.3200000	.0000000
.36	.3241039	.3600000	.0000000
.40	.3735301	.4000000	-.0000000
.44	.4237894	.4400000	.0000000
.48	.4745420	.4800000	.0000000
.52	.5254580	.5200000	.0000000
.56	.5762106	.5600000	.0000000
.60	.6264699	.6000000	.0000000
.64	.6758961	.6400000	.0000000
.68	.7241317	.6800000	.0000000
.72	.7707918	.7200000	.0000000
.76	.8154506	.7599999	.0000001
.80	.8576215	.8000000	.0000000
.84	.8967245	.8400000	.0000000
.88	.9320276	.8800000	.0000000
.92	.9625220	.9200000	.0000000
.96	.9865829	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 2.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0029597	.0400000	-.0000000
.08	.0116750	.0800000	-.0000000
.12	.0258945	.1200000	-.0000000
.16	.0453578	.1600000	.0000000
.20	.0697957	.2000000	-.0000000
.24	.0989284	.2400000	-.0000000
.28	.1324648	.2800001	-.0000001
.32	.1701013	.3200000	.0000000
.36	.2115200	.3600000	-.0000000
.40	.2563872	.4000000	-.0000000
.44	.3043511	.4400000	.0000000
.48	.3550390	.4800000	-.0000000
.52	.4080543	.5200000	.0000000
.56	.4629721	.5600000	.0000000
.60	.5193338	.6000000	-.0000000
.64	.5766400	.6400000	.0000000
.68	.6343409	.6800000	-.0000000
.72	.6918229	.7200000	.0000000
.76	.7483884	.7600000	.0000000
.80	.8032260	.8000000	.0000000
.84	.8553600	.8400000	.0000000
.88	.9035594	.8800000	.0000000
.92	.9461467	.9199999	.0000001
.96	.9804800	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 2.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0006425	.0400000	-.0000000
.08	.0035806	.0800000	-.0000000
.12	.0097159	.1200000	-.0000000
.16	.0196290	.1600000	.0000000
.20	.0337287	.2000000	-.0000000
.24	.0523023	.2400000	-.0000000
.28	.0755397	.2800000	.0000000
.32	.1035476	.3199999	.0000001
.36	.1363570	.3600000	-.0000000
.40	.1739276	.4000000	-.0000000
.44	.2161499	.4400000	-.0000000
.48	.2628445	.4800000	-.0000000
.52	.3137606	.5200000	.0000000
.56	.3685713	.5600000	-.0000000
.60	.4268677	.6000000	-.0000000
.64	.4881494	.6400000	.0000000
.68	.5518112	.6800000	-.0000000
.72	.6171235	.7200000	.0000000
.76	.6832036	.7600000	-.0000000
.80	.7489718	.8000000	.0000000
.84	.8130781	.8400000	.0000000
.88	.8737710	.8800000	.0000000
.92	.9286247	.9200000	.0000000
.96	.9738084	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0001379	.0400001	-.0000001
.08	.0010858	.0800000	-.0000000
.12	.0036056	.1200000	.0000000
.16	.0084039	.1600000	.0000000
.20	.0161301	.2000000	-.0000000
.24	.0273727	.2400000	.0000000
.28	.0426566	.2799999	.0000001
.32	.0624388	.3200000	-.0000000
.36	.0871040	.3600000	.0000000
.40	.1169598	.4000000	-.0000000
.44	.1522302	.4400000	-.0000000
.48	.1930488	.4800000	.0000000
.52	.2394496	.5200000	.0000000
.56	.2913567	.5600000	-.0000000
.60	.3485708	.6000000	-.0000000
.64	.4107520	.6399999	.0000001
.68	.4773972	.6800000	-.0000000
.72	.5478094	.7200000	.0000000
.76	.6210541	.7600000	.0000000
.80	.6958948	.8000000	.0000000
.84	.7706880	.8400000	.0000000
.88	.8432009	.8800000	.0000000
.92	.9102370	.9200000	.0000000
.96	.9666560	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000293	.0400000	-.0000000
.08	.0003265	.0800000	-.0000000
.12	.0013269	.1200000	.0000000
.16	.0035688	.1600000	-.0000000
.20	.0076528	.2000000	-.0000000
.24	.0142151	.2400000	.0000000
.28	.0239071	.2800000	.0000000
.32	.0373765	.3200000	-.0000000
.36	.0552504	.3600000	.0000000
.40	.0781185	.4000000	-.0000000
.44	.1065162	.4400000	-.0000000
.48	.1409067	.4800000	.0000000
.52	.1816614	.5200000	.0000000
.56	.2290376	.5600000	-.0000000
.60	.2831540	.6000000	-.0000000
.64	.3439599	.6400000	-.0000000
.68	.4111977	.6800000	-.0000000
.72	.4843540	.7200000	.0000000
.76	.5625943	.7600000	-.0000000
.80	.6446680	.8000000	-.0000000
.84	.7287624	.8400000	-.0000000
.88	.8122521	.8800000	.0000000
.92	.8912020	.9200000	.0000000
.96	.9590921	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000062	.0400000	-.0000000
.08	.0000975	.0800000	-.0000000
.12	.0004852	.1200000	.0000000
.16	.0015059	.1600000	.0000000
.20	.0036081	.2000000	-.0000000
.24	.0073371	.2400000	.0000000
.28	.0133193	.2799999	.0000001
.32	.0222448	.3200000	-.0000000
.36	.0348493	.3600000	.0000000
.40	.0518937	.4000000	-.0000000
.44	.0741415	.4400000	-.0000000
.48	.1023343	.4800000	.0000000
.52	.1371627	.5200000	-.0000000
.56	.1792346	.5600001	-.0000001
.60	.2290367	.6000000	-.0000000
.64	.2868890	.6400000	-.0000000
.68	.3528885	.6800001	-.0000001
.72	.4268380	.7200000	.0000000
.76	.5081511	.7600000	-.0000000
.80	.5957189	.8000000	-.0000000
.84	.6877094	.8400000	.0000000
.88	.7812328	.8800000	-.0000000
.92	.8716939	.9200000	.0000000
.96	.9511731	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 4.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000013	.0400000	-.0000000
.08	.0000290	.0800000	-.0000000
.12	.0001765	.1200000	.0000000
.16	.0006321	.1600000	.0000000
.20	.0016926	.2000000	-.0000000
.24	.0037684	.2399999	.0000001
.28	.0073847	.2800000	-.0000000
.32	.0131768	.3200000	-.0000000
.36	.0218808	.3599999	.0000001
.40	.0343200	.4000000	-.0000000
.44	.0513862	.4400001	-.0000001
.48	.0740152	.4800000	.0000000
.52	.1031567	.5200000	-.0000000
.56	.1397360	.5600000	.0000000
.60	.1846074	.6000000	-.0000000
.64	.2384956	.6400000	-.0000000
.68	.3019208	.6800000	.0000000
.72	.3751037	.7200000	.0000000
.76	.4578365	.7600000	-.0000000
.80	.5493046	.8000000	-.0000000
.84	.6478194	.8400000	.0000000
.88	.7503817	.8800001	-.0000001
.92	.8518548	.9200000	.0000000
.96	.9429462	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000003	.0400000	-.0000000
.08	.0000086	.0800000	-.0000000
.12	.0000639	.1200000	.0000000
.16	.0002642	.1600000	.0000000
.20	.0007907	.2000000	-.0000000
.24	.0019275	.2400000	.0000000
.28	.0040780	.2800000	.0000000
.32	.0077749	.3200000	-.0000000
.36	.0136861	.3600000	.0000000
.40	.0226139	.4000000	-.0000000
.44	.0354876	.4400000	.0000000
.48	.0533484	.4800000	.0000000
.52	.0773249	.5200000	-.0000000
.56	.1085977	.5600000	.0000000
.60	.1483512	.6000000	-.0000000
.64	.1977076	.6400000	-.0000000
.68	.2576393	.6800000	.0000000
.72	.3288512	.7200000	.0000000
.76	.4116190	.7600000	-.0000000
.80	.5055606	.8000000	-.0000000
.84	.6092947	.8400000	-.0000000
.88	.7198845	.8800000	-.0000000
.92	.8318018	.9200000	.0000000
.96	.9344516	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	NOT DEFINED	NOT DEFINED
.08	.0000025	.0800000	-.0000000
.12	.0000231	.1200000	.0000000
.16	.0001101	.1599999	.0000001
.20	.0003681	.2000000	-.0000000
.24	.0009825	.2400000	.0000000
.28	.0022444	.2799999	.0000001
.32	.0045725	.3200000	-.0000000
.36	.0085330	.3600000	.0000000
.40	.0148541	.4000000	-.0000000
.44	.0244337	.4400000	.0000000
.48	.0383397	.4800000	.0000000
.52	.0577985	.5200000	-.0000000
.56	.0841706	.5600000	.0000000
.60	.1189098	.6000000	-.0000000
.64	.1634987	.6400000	-.0000000
.68	.2193561	.6800000	.0000000
.72	.2877034	.7199999	.0000001
.76	.3693743	.7600000	-.0000000
.80	.4645371	.8000000	-.0000000
.84	.5722726	.8400000	-.0000000
.88	.6898862	.8800000	-.0000000
.92	.8116332	.9200000	.0000000
.96	.9257240	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000007	.0800000	-.0000000
.12	.0000083	.1200000	.0000000
.16	.0000457	.1600000	.0000000
.20	.0001708	.2000000	-.0000000
.24	.0004994	.2400000	.0000000
.28	.0012317	.2799999	.0000001
.32	.0026815	.3200001	-.0000001
.36	.0053055	.3600000	.0000000
.40	.0097308	.4000000	-.0000000
.44	.0167792	.4400000	.0000000
.48	.0274839	.4800000	.0000000
.52	.0430976	.5200000	-.0000000
.56	.0650853	.5600000	.0000000
.60	.0950988	.6000000	-.0000000
.64	.1349239	.6400000	-.0000000
.68	.1863929	.6800000	.0000000
.72	.2512456	.7200000	-.0000000
.76	.3309181	.7600000	.0000000
.80	.4262214	.8000000	-.0000000
.84	.5368395	.8400000	-.0000000
.88	.6604992	.8800000	-.0000000
.92	.7914310	.9200001	-.0000001
.96	.9167937	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800000	-.0000000
.12	.0000030	.1200000	-.0000000
.16	.0000189	.1599999	.0000001
.20	.0000791	.2000000	-.0000000
.24	.0002532	.2400000	-.0000000
.28	.0006743	.2800000	.0000000
.32	.0015688	.3200000	.0000000
.36	.0032909	.3600000	-.0000000
.40	.0063598	.4000000	-.0000000
.44	.0114965	.4400000	.0000000
.48	.0196587	.4800000	-.0000000
.52	.0320680	.5200000	-.0000000
.56	.0502251	.5600000	.0000000
.60	.0759076	.6000000	-.0000000
.64	.1111373	.6400001	-.0000001
.68	.1581081	.6799999	.0000001
.72	.2190545	.7200000	-.0000000
.76	.2960312	.7600000	.0000000
.80	.3905581	.8000000	-.0000000
.84	.5030442	.8400000	-.0000000
.88	.6318104	.8800000	-.0000000
.92	.7712653	.9200000	-.0000000
.96	.9076876	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000011	.1200000	-.0000000
.16	.0000078	.1600000	.0000000
.20	.0000365	.2000000	-.0000000
.24	.0001281	.2400000	-.0000000
.28	.0003683	.2799999	.0000001
.32	.0009158	.3200000	.0000000
.36	.0020371	.3600000	-.0000000
.40	.0041482	.4000000	-.0000000
.44	.0078614	.4400000	.0000000
.48	.0140344	.4800000	-.0000000
.52	.0238163	.5200000	-.0000000
.56	.0386879	.5600000	.0000000
.60	.0604847	.6000000	-.0000000
.64	.0913938	.6400000	.0000000
.68	.1339081	.6800000	.0000000
.72	.1907133	.7200000	-.0000000
.76	.2644744	.7600000	.0000000
.80	.3574607	.8000000	-.0000000
.84	.4709052	.8400000	-.0000000
.88	.6038853	.8800000	.0000000
.92	.7511948	.9200000	.0000000
.96	.8984295	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000004	.1200000	-.0000000
.16	.0000032	.1600000	.0000000
.20	.0000168	.2000000	-.0000000
.24	.0000647	.2400000	-.0000000
.28	.0002008	.2800000	.0000000
.32	.0005336	.3200000	.0000000
.36	.0012586	.3600000	-.0000000
.40	.0027008	.4000000	-.0000000
.44	.0053663	.4400000	.0000000
.48	.0100020	.4800000	-.0000000
.52	.0176589	.5200000	-.0000000
.56	.0297534	.5600000	.0000000
.60	.0481217	.6000000	-.0000000
.64	.0750481	.6400000	.0000000
.68	.1132557	.6800000	.0000000
.72	.1658251	.7200000	-.0000000
.76	.2360026	.7600000	.0000000
.80	.3268225	.8000000	-.0000000
.84	.4404191	.8400000	-.0000000
.88	.5767725	.8800000	.0000000
.92	.7312700	.9200000	.0000000
.96	.8890407	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000001	.1200000	.0000000
.16	.0000013	.1600000	.0000000
.20	.0000077	.2000000	-.0000000
.24	.0000326	.2400000	.0000000
.28	.0001093	.2800000	-.0000000
.32	.0003104	.3200000	.0000000
.36	.0007764	.3600000	.0000000
.40	.0017556	.4000000	-.0000000
.44	.0036574	.4400000	.0000000
.48	.0071174	.4800000	.0000000
.52	.0130738	.5200000	-.0000000
.56	.0228494	.5600000	.0000000
.60	.0382328	.6000000	-.0000000
.64	.0615447	.6400000	.0000000
.68	.0956691	.6800000	.0000000
.72	.1440169	.7200000	-.0000000
.76	.2103703	.7600000	.0000000
.80	.2985229	.8000000	-.0000000
.84	.4115644	.8400000	-.0000000
.88	.5505064	.8800000	.0000000
.92	.7115334	.9200000	.0000000
.96	.8795405	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000005	.1600000	-.0000000
.20	.0000036	.2000000	-.0000000
.24	.0000164	.2400000	.0000000
.28	.0000594	.2800000	.0000000
.32	.0001803	.3200000	.0000000
.36	.0004782	.3600000	.0000000
.40	.0011396	.4000000	-.0000000
.44	.0024892	.4400000	.0000000
.48	.0050578	.4800000	.0000000
.52	.0096666	.5200000	-.0000000
.56	.0175250	.5600000	.0000000
.60	.0303386	.6000000	-.0000000
.64	.0504113	.6400000	.0000000
.68	.0807227	.6800000	.0000000
.72	.1249450	.7200000	-.0000000
.76	.1873394	.7600000	.0000000
.80	.2724347	.8000000	-.0000000
.84	.3843071	.8400000	-.0000000
.88	.5251103	.8800000	.0000000
.92	.6920213	.9200000	.0000000
.96	.8699463	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 1.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000002	.1600000	-.0000000
.20	.0000016	.2000000	-.0000000
.24	.0000082	.2400000	.0000000
.28	.0000322	.2800000	.0000000
.32	.0001046	.3200000	.0000000
.36	.0002942	.3599999	.0000001
.40	.0007387	.4000000	-.0000000
.44	.0016920	.4400000	.0000000
.48	.0035898	.4800000	.0000000
.52	.0071386	.5200000	-.0000000
.56	.0134255	.5600000	.0000000
.60	.0240472	.6000000	-.0000000
.64	.0412472	.6400000	.0000000
.68	.0680415	.6800000	.0000000
.72	.1082942	.7200000	-.0000000
.76	.1666812	.7600000	.0000000
.80	.2484259	.8000000	-.0000000
.84	.3586027	.8400000	-.0000000
.88	.5005972	.8800000	.0000000
.92	.6727643	.9200000	.0000000
.96	.8602738	.9600000	-.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 2.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0046720	.0400000	-.0000000
.08	.0181760	.0800000	-.0000000
.12	.0397440	.1200000	-.0000000
.16	.0686080	.1600000	.0000000
.20	.1040000	.2000000	-.0000000
.24	.1451520	.2400000	-.0000000
.28	.1912960	.2800000	-.0000000
.32	.2416640	.3200000	.0000000
.36	.2954880	.3600000	-.0000000
.40	.3520000	.4000000	-.0000000
.44	.4104320	.4400000	.0000000
.48	.4700160	.4800000	.0000000
.52	.5299840	.5200000	.0000000
.56	.5895680	.5600000	.0000000
.60	.6480000	.6000000	.0000000
.64	.7045120	.6400000	.0000000
.68	.7583360	.6800000	.0000000
.72	.8087040	.7200000	.0000000
.76	.8548480	.7600000	.0000000
.80	.8960000	.8000000	.0000000
.84	.9313920	.8400000	.0000000
.88	.9602560	.8800000	.0000000
.92	.9818240	.9200000	.0000000
.96	.9953280	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 2.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0010880	.0400000	-.0000000
.08	.0059736	.0800000	-.0000000
.12	.0159626	.1200000	-.0000000
.16	.0317440	.1599999	.0000001
.20	.0536656	.2000000	-.0000000
.24	.0818326	.2400000	-.0000000
.28	.1161591	.2800000	.0000000
.32	.1564007	.3200000	.0000000
.36	.2021760	.3600000	-.0000000
.40	.2529822	.4000000	-.0000000
.44	.3082073	.4399999	.0000001
.48	.3671393	.4800000	-.0000000
.52	.4289741	.5200000	.0000000
.56	.4928212	.5600000	.0000000
.60	.5577096	.6000000	.0000000
.64	.6225920	.6400000	.0000000
.68	.6863487	.6800000	.0000000
.72	.7477909	.7200000	.0000000
.76	.8056640	.7600000	.0000000
.80	.8586501	.8000000	.0000000
.84	.9053703	.8400000	.0000000
.88	.9443871	.8800000	.0000000
.92	.9742060	.9200000	.0000000
.96	.9932779	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0002483	.0400001	-.0000001
.08	.0019251	.0800000	-.0000000
.12	.0062899	.1200000	.0000000
.16	.0144179	.1600000	.0000000
.20	.0272000	.2000000	-.0000000
.24	.0453427	.2400000	.0000000
.28	.0693683	.2800000	.0000000
.32	.0996147	.3200000	-.0000000
.36	.1362355	.3600001	-.0000001
.40	.1792000	.4000000	-.0000000
.44	.2282931	.4400000	-.0000000
.48	.2831155	.4800000	-.0000000
.52	.3430835	.5200000	.0000000
.56	.4074291	.5600000	-.0000000
.60	.4752000	.6000000	-.0000000
.64	.5452595	.6400000	.0000000
.68	.6162867	.6800000	-.0000000
.72	.6867763	.7200000	.0000000
.76	.7550387	.7599999	.0000001
.80	.8192000	.8000000	.0000000
.84	.8772019	.8400000	.0000000
.88	.9268019	.8800000	.0000000
.92	.9655731	.9200000	.0000000
.96	.9909043	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000558	.0400000	-.0000000
.08	.0006111	.0800000	-.0000000
.12	.0024423	.1200000	.0000000
.16	.0064553	.1600000	-.0000000
.20	.0135953	.2000000	-.0000000
.24	.0247868	.2400000	.0000000
.28	.0408880	.2800000	.0000000
.32	.0626530	.3200000	-.0000000
.36	.0906993	.3600000	.0000000
.40	.1254792	.4000000	-.0000000
.44	.1672538	.4400000	-.0000000
.48	.2160695	.4800000	.0000000
.52	.2717356	.5200000	.0000000
.56	.3338042	.5600000	-.0000000
.60	.4015509	.6000000	-.0000000
.64	.4739564	.6400000	.0000000
.68	.5496890	.6800000	-.0000000
.72	.6270886	.7200000	.0000000
.76	.7041503	.7600000	.0000000
.80	.7785094	.8000000	.0000000
.84	.8474266	.8400000	.0000000
.88	.9077739	.8799999	.0000001
.92	.9560209	.9200000	.0000000
.96	.9882212	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 4.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000124	.0400000	-.0000000
.08	.0001917	.0800000	-.0000000
.12	.0009373	.1200000	.0000000
.16	.0028574	.1600000	.0000000
.20	.0067200	.2000000	-.0000000
.24	.0134038	.2400000	.0000000
.28	.0238487	.2800000	.0000000
.32	.0390070	.3200000	-.0000000
.36	.0597943	.3600000	.0000000
.40	.0870400	.4000000	-.0000000
.44	.1214383	.4400000	-.0000000
.48	.1634992	.4800000	.0000000
.52	.2134992	.5200000	.0000000
.56	.2714321	.5600000	-.0000000
.60	.3369600	.6000000	-.0000000
.64	.4093641	.6400000	-.0000000
.68	.4874954	.6800000	-.0000000
.72	.5697257	.7200000	.0000000
.76	.6538986	.7600000	-.0000000
.80	.7372800	.8000000	.0000000
.84	.8165090	.8399999	.0000001
.88	.8875491	.8800000	.0000000
.92	.9456387	.9200000	.0000000
.96	.9852420	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000027	.0400000	-.0000000
.08	.0000595	.0800000	-.0000000
.12	.0003563	.1200000	.0000000
.16	.0012530	.1600000	.0000000
.20	.0032915	.2000000	-.0000000
.24	.0071841	.2400000	.0000000
.28	.0137904	.2800000	-.0000000
.32	.0240825	.3200000	-.0000000
.36	.0391015	.3600000	.0000000
.40	.0599062	.4000000	-.0000000
.44	.0875144	.4400000	-.0000000
.48	.1228378	.4800000	.0000000
.52	.1666104	.5200000	-.0000000
.56	.2193120	.5600001	-.0000001
.60	.2810856	.6000000	-.0000000
.64	.3516504	.6400000	-.0000000
.68	.4302094	.6800000	-.0000000
.72	.5153528	.7200000	.0000000
.76	.6049570	.7600000	.0000000
.80	.6960790	.8000000	.0000000
.84	.7848474	.8400000	.0000000
.88	.8663487	.8800000	.0000000
.92	.9345104	.9200000	.0000000
.96	.9819798	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000006	.0400000	-.0000000
.08	.0000184	.0800000	-.0000000
.12	.0001344	.1200000	.0000000
.16	.0005453	.1600000	-.0000000
.20	.0016000	.2000000	-.0000000
.24	.0038221	.2400000	.0000000
.28	.0079168	.2800001	-.0000001
.32	.0147640	.3200000	-.0000000
.36	.0253958	.3600000	.0000000
.40	.0409600	.4000000	-.0000000
.44	.0626682	.4400000	.0000000
.48	.0917294	.4799999	.0000001
.52	.1292694	.5200000	-.0000000
.56	.1762342	.5600000	.0000000
.60	.2332800	.6000000	-.0000000
.64	.3006477	.6400000	-.0000000
.68	.3780227	.6800001	-.0000001
.72	.4643802	.7200000	.0000000
.76	.5578156	.7600000	-.0000000
.80	.6553600	.8000000	.0000000
.84	.7527015	.8400000	.0000000
.88	.8443711	.8800000	.0000000
.92	.9227141	.9200000	.0000000
.96	.9784472	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	.0400000	-.0000000
.08	.0000056	.0800000	-.0000000
.12	.0000503	.1200000	.0000000
.16	.0002357	.1600000	.0000000
.20	.0007728	.2000000	-.0000000
.24	.0020207	.2400000	.0000000
.28	.0045170	.2800000	.0000000
.32	.0089971	.3200000	-.0000000
.36	.0163984	.3600000	.0000000
.40	.0278483	.4000000	-.0000000
.44	.0446324	.4400000	.0000000
.48	.0681419	.4800000	.0000000
.52	.0997975	.5200000	-.0000000
.56	.1409484	.5600000	.0000000
.60	.1927444	.6000000	-.0000000
.64	.2559801	.6400000	-.0000000
.68	.3309086	.6800000	.0000000
.72	.4170253	.7200000	.0000000
.76	.5128174	.7600000	-.0000000
.80	.6154804	.8000000	-.0000000
.84	.7205994	.8400000	.0000000
.88	.8217937	.8800000	.0000000
.92	.9103231	.9200000	.0000000
.96	.9746566	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000017	.0800000	-.0000000
.12	.0000188	.1200000	.0000000
.16	.0001013	.1600000	.0000000
.20	.0003712	.2000000	-.0000000
.24	.0010625	.2400000	.0000000
.28	.0025637	.2800000	.0000000
.32	.0054546	.3200000	-.0000000
.36	.0105356	.3600000	.0000000
.40	.0188416	.4000000	-.0000000
.44	.0316375	.4400000	.0000000
.48	.0503900	.4800000	.0000000
.52	.0767100	.5200000	-.0000000
.56	.1122612	.5600000	.0000000
.60	.1586304	.6000000	-.0000000
.64	.2171535	.6400000	-.0000000
.68	.2886930	.6800000	.0000000
.72	.3733617	.7200000	.0000000
.76	.4701878	.7600000	-.0000000
.80	.5767168	.8000000	-.0000000
.84	.6885441	.8400000	-.0000000
.88	.7987750	.8800000	.0000000
.92	.8974054	.9200000	.0000000
.96	.9706197	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000005	.0800000	-.0000000
.12	.0000070	.1199999	.0000001
.16	.0000434	.1600000	.0000000
.20	.0001775	.2000000	-.0000000
.24	.0005561	.2399999	.0000001
.28	.0014484	.2800000	-.0000000
.32	.0032921	.3200001	-.0000001
.36	.0067393	.3599999	.0000001
.40	.0126936	.4000000	-.0000000
.44	.0223337	.4400000	.0000000
.48	.0371144	.4800000	.0000000
.52	.0587380	.5200000	-.0000000
.56	.0890860	.5600000	.0000000
.60	.1301025	.6000000	-.0000000
.64	.1836184	.6400000	-.0000000
.68	.2511069	.6800000	.0000000
.72	.3333576	.7199999	.0000001
.76	.4300593	.7600000	-.0000000
.80	.5392781	.8000000	-.0000000
.84	.6568187	.8400000	.0000000
.88	.7754564	.8800000	-.0000000
.92	.8840248	.9200000	.0000000
.96	.9663480	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800000	-.0000000
.12	.0000026	.1200000	-.0000000
.16	.0000185	.1600000	-.0000000
.20	.0000845	.2000000	-.0000000
.24	.0002899	.2400000	-.0000000
.28	.0008150	.2800000	.0000000
.32	.0019791	.3200000	.0000000
.36	.0042944	.3600000	-.0000000
.40	.0085197	.4000000	-.0000000
.44	.0157085	.4400000	.0000000
.48	.0272400	.4800000	-.0000000
.52	.0448239	.5200000	-.0000000
.56	.0704655	.5600000	.0000000
.60	.1063757	.6000000	-.0000000
.64	.1548112	.6400001	-.0000001
.68	.2178248	.6800000	.0000000
.72	.2969061	.7200000	-.0000000
.76	.3924912	.7600000	-.0000000
.80	.5033165	.8000000	-.0000000
.84	.6255915	.8400000	.0000000
.88	.7519631	.8800000	-.0000000
.92	.8702407	.9199999	.0000001
.96	.9618528	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000009	.1200000	-.0000000
.16	.0000078	.1600000	.0000000
.20	.0000401	.2000000	-.0000000
.24	.0001505	.2400000	-.0000000
.28	.0004569	.2800000	.0000000
.32	.0011856	.3200000	.0000000
.36	.0027271	.3600000	-.0000000
.40	.0056992	.4000000	-.0000000
.44	.0110128	.4400000	.0000000
.48	.0199299	.4800000	-.0000000
.52	.0341022	.5200000	-.0000000
.56	.0555749	.5599999	.0000001
.60	.0867350	.6000000	-.0000000
.64	.1301822	.6400000	.0000000
.68	.1884932	.6799999	.0000001
.72	.2638490	.7200000	-.0000000
.76	.3574868	.7600000	.0000000
.80	.4689374	.8000000	-.0000000
.84	.5950005	.8400000	-.0000000
.88	.7284062	.8800000	-.0000000
.92	.8561083	.9199999	.0000001
.96	.9571447	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000003	.1200000	.0000000
.16	.0000033	.1600000	.0000000
.20	.0000189	.2000000	-.0000000
.24	.0000779	.2400000	.0000000
.28	.0002554	.2800000	.0000000
.32	.0007081	.3200000	.0000000
.36	.0017265	.3600001	-.0000001
.40	.0038011	.4000000	-.0000000
.44	.0076984	.4399999	.0000001
.48	.0145405	.4800000	-.0000000
.52	.0258745	.5200000	-.0000000
.56	.0437162	.5600000	.0000000
.60	.0705439	.6000000	-.0000000
.64	.1092123	.6400000	.0000000
.68	.1627501	.6800000	.0000000
.72	.2339941	.7200000	-.0000000
.76	.3250062	.7600000	.0000000
.80	.4362076	.8000000	-.0000000
.84	.5651570	.8400000	-.0000000
.88	.7048837	.8800000	-.0000000
.92	.8416790	.9200000	.0000000
.96	.9522342	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.5 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000001	.1200000	.0000000
.16	.0000014	.1600000	-.0000000
.20	.0000089	.2000000	-.0000000
.24	.0000402	.2400000	.0000000
.28	.0001423	.2800000	.0000000
.32	.0004217	.3200000	.0000000
.36	.0010901	.3600000	.0000000
.40	.0025284	.4000000	-.0000000
.44	.0053675	.4400000	.0000000
.48	.0105816	.4800000	.0000000
.52	.0195836	.5200000	-.0000000
.56	.0343065	.5600000	.0000000
.60	.0572451	.6000000	-.0000000
.64	.0914231	.6400000	.0000000
.68	.1402390	.6800000	.0000000
.72	.2071300	.7200000	-.0000000
.76	.2949777	.7600000	.0000000
.80	.4051620	.8000000	-.0000000
.84	.5361495	.8400000	-.0000000
.88	.6814815	.8800000	.0000000
.92	.8270006	.9200000	.0000000
.96	.9471315	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 9.0 AND B = 2.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000000	NOT DEFINED	NOT DEFINED
.16	.0000006	.1600000	-.0000000
.20	.0000042	.2000000	-.0000000
.24	.0000207	.2400000	.0000000
.28	.0000791	.2800000	.0000000
.32	.0002505	.3200000	.0000000
.36	.0006865	.3600000	.0000000
.40	.0016777	.4000000	-.0000000
.44	.0037335	.4400000	.0000000
.48	.0076828	.4800000	.0000000
.52	.0147891	.5200000	-.0000000
.56	.0268642	.5600000	.0000000
.60	.0463574	.6000000	-.0000000
.64	.0763810	.6400000	.0000000
.68	.1206179	.6800000	.0000000
.72	.1830354	.7200000	-.0000000
.76	.2673064	.7600000	.0000000
.80	.3758096	.8000000	-.0000000
.84	.5080464	.8400000	-.0000000
.88	.6582750	.8800000	-.0000000
.92	.8121175	.9200000	.0000000
.96	.9418462	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 2.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0016645	.0400000	-.0000000
.08	.0090042	.0800000	-.0000000
.12	.0236974	.1200000	-.0000000
.16	.0463959	.1600000	.0000000
.20	.0771887	.2000000	-.0000000
.24	.1157809	.2400000	-.0000000
.28	.1615941	.2800000	.0000000
.32	.2138329	.3200000	.0000000
.36	.2715348	.3600000	-.0000000
.40	.3336096	.4000000	-.0000000
.44	.3988727	.4400000	.0000000
.48	.4660741	.4800000	.0000000
.52	.5339259	.5200000	.0000000
.56	.6011273	.5600000	.0000000
.60	.6663904	.6000000	.0000000
.64	.7284652	.6400000	.0000000
.68	.7861671	.6800000	.0000000
.72	.8384059	.7200000	.0000000
.76	.8842191	.7600000	.0000000
.80	.9228113	.8000000	.0000000
.84	.9536041	.8400000	.0000000
.88	.9763026	.8800000	.0000000
.92	.9909958	.9200000	.0000000
.96	.9983355	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0004013	.0400000	-.0000000
.08	.0030625	.0800000	-.0000000
.12	.0098465	.1200001	-.0000001
.16	.0222001	.1600000	.0000000
.20	.0411741	.2000000	-.0000000
.24	.0674439	.2400001	-.0000001
.28	.1013313	.2800000	.0000000
.32	.1428268	.3199999	.0000001
.36	.1916134	.3600000	-.0000000
.40	.2470920	.4000000	-.0000000
.44	.3084076	.4400000	-.0000000
.48	.3744778	.4800000	-.0000000
.52	.4440233	.5200000	.0000000
.56	.5156008	.5600000	.0000000
.60	.5876390	.6000000	.0000000
.64	.6584781	.6400000	.0000000
.68	.7264146	.6800000	.0000000
.72	.7897521	.7200000	.0000000
.76	.8468603	.7600000	.0000000
.80	.8962464	.8000000	.0000000
.84	.9366451	.8400000	.0000000
.88	.9671370	.8800000	.0000000
.92	.9873232	.9200000	.0000000
.96	.9976218	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000947	.0400000	-.0000000
.08	.0010207	.0800000	-.0000000
.12	.0040114	.1200000	.0000000
.16	.0104212	.1600000	-.0000000
.20	.0215599	.2000000	-.0000000
.24	.0385909	.2400000	.0000000
.28	.0624595	.2800000	.0000000
.32	.0938425	.3200000	-.0000000
.36	.1331127	.3600000	.0000000
.40	.1803149	.4000000	-.0000000
.44	.2351530	.4400000	-.0000000
.48	.2969870	.4800000	-.0000000
.52	.3648390	.5200000	.0000000
.56	.4374079	.5600000	-.0000000
.60	.5130959	.6000000	-.0000000
.64	.5900434	.6400001	-.0000001
.68	.6661770	.6800000	.0000000
.72	.7392714	.7200000	.0000000
.76	.8070292	.7600000	.0000000
.80	.8671827	.8000000	.0000000
.84	.9176295	.8400000	.0000000
.88	.9566165	.8800000	.0000000
.92	.9830123	.9200000	.0000000
.96	.9967658	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 4.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000220	.0400000	-.0000000
.08	.0003347	.0800000	-.0000000
.12	.0016085	.1200000	.0000000
.16	.0048169	.1600000	.0000000
.20	.0111213	.2000000	-.0000000
.24	.0217628	.2400000	.0000000
.28	.0379626	.2800000	.0000000
.32	.0608310	.3200000	-.0000000
.36	.0912844	.3600000	.0000000
.40	.1299730	.4000000	-.0000000
.44	.1772186	.4400000	-.0000000
.48	.2329632	.4800000	.0000000
.52	.2967302	.5200000	.0000000
.56	.3675997	.5600000	-.0000000
.60	.4441981	.6000000	-.0000000
.64	.5247060	.6400000	.0000000
.68	.6068862	.6800000	-.0000000
.72	.6881361	.7200000	.0000000
.76	.7655701	.7600000	.0000000
.80	.8361409	.8000000	.0000000
.84	.8968154	.8400000	.0000000
.88	.9448285	.8800000	.0000000
.92	.9780729	.9200000	.0000000
.96	.9957638	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000050	.0400001	-.0000001
.08	.0001083	.0800000	-.0000000
.12	.0006366	.1200000	.0000000
.16	.0021984	.1600000	.0000000
.20	.0056660	.2000000	-.0000000
.24	.0121258	.2400000	.0000000
.28	.0228056	.2800000	-.0000000
.32	.0389898	.3200000	-.0000000
.36	.0619243	.3600000	.0000000
.40	.0927180	.4000000	-.0000000
.44	.1322436	.4400000	-.0000000
.48	.1810417	.4800000	.0000000
.52	.2392315	.5200000	.0000000
.56	.3064323	.5600000	-.0000000
.60	.3817005	.6000000	-.0000000
.64	.4634862	.6400000	.0000000
.68	.5496150	.6800000	-.0000000
.72	.6373044	.7200000	.0000000
.76	.7232229	.7600000	.0000000
.80	.8036071	.8000000	.0000000
.84	.8744599	.8400000	.0000000
.88	.9318683	.8800000	.0000000
.92	.9725197	.9200000	.0000000
.96	.9946130	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000011	.0400000	-.0000000
.08	.0000347	.0800000	-.0000000
.12	.0002493	.1200000	.0000000
.16	.0009927	.1600000	-.0000000
.20	.0028568	.2000000	-.0000000
.24	.0066880	.2400000	.0000000
.28	.0135657	.2800000	-.0000000
.32	.0247529	.3200000	-.0000000
.36	.0416215	.3599999	.0000001
.40	.0655576	.4000000	-.0000000
.44	.0978493	.4400000	-.0000000
.48	.1395635	.4800000	.0000000
.52	.1914156	.5200000	-.0000000
.56	.2536388	.5600000	-.0000000
.60	.3258593	.6000000	-.0000000
.64	.4069866	.6400000	-.0000000
.68	.4951272	.6800000	-.0000000
.72	.5875363	.7200000	.0000000
.76	.6806218	.7600000	.0000000
.80	.7700249	.8000000	.0000000
.84	.8508121	.8400000	.0000000
.88	.9178352	.8800000	.0000000
.92	.9663712	.9200000	.0000000
.96	.9933113	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000003	.0400000	-.0000000
.08	.0000110	.0800000	-.0000000
.12	.0000967	.1200000	.0000000
.16	.0004442	.1600000	.0000000
.20	.0014277	.2000000	-.0000000
.24	.0036569	.2400000	.0000000
.28	.0080015	.2800000	.0000000
.32	.0155860	.3200000	-.0000000
.36	.0277539	.3600000	.0000000
.40	.0459996	.4000000	-.0000000
.44	.0718701	.4400000	.0000000
.48	.1068366	.4799999	.0000001
.52	.1521436	.5200000	-.0000000
.56	.2086371	.5600000	.0000000
.60	.2765842	.6000000	-.0000000
.64	.3554907	.6400000	-.0000000
.68	.4439321	.6800000	-.0000000
.72	.5394162	.7200000	.0000000
.76	.6382993	.7600000	-.0000000
.80	.7357931	.8000000	.0000000
.84	.8261099	.8400000	.0000000
.88	.9028305	.8800000	.0000000
.92	.9596488	.9200000	.0000000
.96	.9918574	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	NOT DEFINED	NOT DEFINED
.08	.0000035	.0800000	-.0000000
.12	.0000372	.1200000	.0000000
.16	.0001972	.1600000	.0000000
.20	.0007080	.2000000	-.0000000
.24	.0019846	.2400000	.0000000
.28	.0046852	.2800000	.0000000
.32	.0097444	.3200000	-.0000000
.36	.0183793	.3600000	.0000000
.40	.0320615	.4000000	-.0000000
.44	.0524500	.4400000	.0000000
.48	.0812821	.4800000	.0000000
.52	.1202230	.5200000	-.0000000
.56	.1706753	.5600000	.0000000
.60	.2335551	.6000000	-.0000000
.64	.3090440	.6400000	-.0000000
.68	.3963322	.6800001	-.0000001
.72	.4933749	.7200000	.0000000
.76	.5966929	.7600000	.0000000
.80	.7012642	.8000000	.0000000
.84	.8005765	.8400000	.0000000
.88	.8869549	.8800000	.0000000
.92	.9523760	.9200000	.0000000
.96	.9902506	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000011	.0800000	-.0000000
.12	.0000142	.1199999	.0000001
.16	.0000870	.1600000	.0000000
.20	.0003488	.2000000	-.0000000
.24	.0010701	.2400000	.0000000
.28	.0027259	.2800000	-.0000000
.32	.0060543	.3200001	-.0000001
.36	.0120976	.3600000	.0000000
.40	.0222157	.4000000	-.0000000
.44	.0380609	.4400000	.0000000
.48	.0615041	.4800000	.0000000
.52	.0945073	.5200000	-.0000000
.56	.1389358	.5600000	.0000000
.60	.1963136	.6000000	-.0000000
.64	.2675234	.6400000	-.0000000
.68	.3524684	.6800000	.0000000
.72	.4497149	.7200000	.0000000
.76	.5561549	.7600000	-.0000000
.80	.6667461	.8000000	.0000000
.84	.7744194	.8399999	.0000001
.88	.8703081	.8800000	.0000000
.92	.9445781	.9200000	.0000000
.96	.9884907	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000003	.0800000	-.0000000
.12	.0000054	.1200000	-.0000000
.16	.0000381	.1600000	.0000000
.20	.0001708	.2000000	-.0000000
.24	.0005736	.2400000	-.0000000
.28	.0015770	.2800000	.0000000
.32	.0037409	.3200000	.0000000
.36	.0079203	.3600000	-.0000000
.40	.0153135	.4000000	-.0000000
.44	.0274804	.4400000	.0000000
.48	.0463133	.4800000	.0000000
.52	.0739478	.5200000	-.0000000
.56	.1126008	.5600000	.0000000
.60	.1643269	.6000000	-.0000000
.64	.2306899	.6400000	-.0000000
.68	.3123565	.6800000	.0000000
.72	.4086297	.7200000	.0000000
.76	.5169605	.7600000	-.0000000
.80	.6325035	.8000000	.0000000
.84	.7478291	.8400000	.0000000
.88	.8529866	.8800000	.0000000
.92	.9362815	.9200000	.0000000
.96	.9865778	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	.0800001	-.0000001
.12	.0000020	.1200000	-.0000000
.16	.0000166	.1600000	-.0000000
.20	.0000832	.2000000	-.0000000
.24	.0003060	.2400000	-.0000000
.28	.0009078	.2800000	-.0000000
.32	.0023002	.3200000	.0000000
.36	.0051606	.3600000	-.0000000
.40	.0105068	.4000000	-.0000000
.44	.0197519	.4400000	.0000000
.48	.0347230	.4800000	-.0000000
.52	.0576201	.5200000	-.0000000
.56	.0908956	.5600000	.0000000
.60	.1370368	.6000000	-.0000000
.64	.1982323	.6400000	-.0000000
.68	.2759204	.6800000	.0000000
.72	.3702257	.7199999	.0000001
.76	.4793184	.7600000	-.0000000
.80	.5987614	.8000000	-.0000000
.84	.7209793	.8400000	.0000000
.88	.8350838	.8800000	.0000000
.92	.9275134	.9200000	.0000000
.96	.9845127	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000008	.1200001	-.0000001
.16	.0000072	.1600000	.0000000
.20	.0000404	.2000000	-.0000000
.24	.0001624	.2400001	-.0000001
.28	.0005203	.2800000	-.0000000
.32	.0014082	.3200000	.0000000
.36	.0033482	.3600000	-.0000000
.40	.0071788	.4000000	-.0000000
.44	.0141395	.4400000	.0000000
.48	.0259314	.4800000	-.0000000
.52	.0447283	.5200000	-.0000000
.56	.0731102	.5599999	.0000001
.60	.1138893	.6000000	-.0000000
.64	.1697976	.6400001	-.0000001
.68	.2430165	.6800000	.0000000
.72	.3345381	.7199999	.0000001
.76	.4433788	.7600000	-.0000000
.80	.5657074	.8000000	-.0000000
.84	.6940267	.8400000	.0000000
.88	.8156889	.8800000	.0000000
.92	.9183016	.9200000	.0000000
.96	.9822963	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.5 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000003	.1200000	.0000000
.16	.0000031	.1600000	.0000000
.20	.0000195	.2000000	-.0000000
.24	.0000859	.2400000	.0000000
.28	.0002970	.2800000	.0000000
.32	.0008587	.3200000	.0000000
.36	.0021639	.3600000	.0000000
.40	.0048864	.4000000	-.0000000
.44	.0100848	.4399999	.0000001
.48	.0192971	.4800000	-.0000000
.52	.0346024	.5200000	-.0000000
.56	.0586125	.5600000	.0000000
.60	.0943575	.6000000	-.0000000
.64	.1450168	.6400000	.0000000
.68	.2134571	.6799999	.0000001
.72	.3015471	.7200000	-.0000000
.76	.4092434	.7600001	-.0000001
.80	.5334960	.8000000	-.0000000
.84	.6671118	.8400000	-.0000000
.88	.7978870	.8800000	-.0000000
.92	.9086741	.9200000	.0000000
.96	.9799300	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 9.0 AND B = 2.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000001	.1200000	.0000000
.16	.0000013	.1600000	.0000000
.20	.0000094	.2000000	-.0000000
.24	.0000453	.2400000	.0000000
.28	.0001689	.2800000	-.0000000
.32	.0005218	.3200000	.0000000
.36	.0013936	.3600000	.0000000
.40	.0033147	.4000000	-.0000000
.44	.0071689	.4400000	.0000000
.48	.0143138	.4800000	.0000000
.52	.0266852	.5200000	-.0000000
.56	.0468489	.5600000	.0000000
.60	.0779524	.6000000	-.0000000
.64	.1235195	.6400000	.0000000
.68	.1870245	.6800000	.0000000
.72	.2711898	.7200000	-.0000000
.76	.3769714	.7600000	.0000000
.80	.5022511	.8000000	-.0000000
.84	.6403589	.8400000	.0000000
.88	.7787579	.8800000	-.0000000
.92	.8986587	.9200000	.0000000
.96	.9774154	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 3.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0006022	.0400000	-.0000000
.08	.0045253	.0800000	-.0000000
.12	.0143189	.1200001	-.0000001
.16	.0317587	.1600000	.0000000
.20	.0579200	.2000000	-.0000000
.24	.0932512	.2400000	-.0000000
.28	.1376478	.2800000	.0000000
.32	.1905263	.3200000	.0000000
.36	.2508973	.3600000	-.0000000
.40	.3174400	.4000000	-.0000000
.44	.3885753	.4400000	.0000000
.48	.4625400	.4799999	.0000001
.52	.5374600	.5199999	.0000001
.56	.6114247	.5600000	.0000000
.60	.6825600	.6000000	.0000000
.64	.7491027	.6400000	.0000000
.68	.8094737	.6800000	.0000000
.72	.8623522	.7199999	.0000001
.76	.9067488	.7599999	.0000001
.80	.9420800	.8000000	.0000000
.84	.9682413	.8400000	.0000000
.88	.9856811	.8800000	.0000000
.92	.9954747	.9200000	.0000000
.96	.9993978	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.5 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0001487	.0400000	-.0000000
.08	.0015764	.0800000	-.0000000
.12	.0060928	.1200000	.0000000
.16	.0155592	.1600000	-.0000000
.20	.0316269	.2000000	-.0000000
.24	.0555915	.2400000	.0000000
.28	.0883088	.2799999	.0000001
.32	.1301513	.3200000	-.0000000
.36	.1809954	.3600001	-.0000001
.40	.2402319	.4000000	-.0000000
.44	.3067978	.4400000	-.0000000
.48	.3792249	.4800000	-.0000000
.52	.4557046	.5200000	.0000000
.56	.5341656	.5600000	-.0000000
.60	.6123651	.6000000	.0000000
.64	.6879917	.6400000	.0000000
.68	.7587733	.6800000	.0000000
.72	.8226263	.7200000	.0000000
.76	.8777387	.7600000	.0000000
.80	.9227626	.8000000	.0000000
.84	.9569402	.8399999	.0000001
.88	.9802680	.8800000	.0000000
.92	.9936642	.9200000	.0000000
.96	.9991436	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000360	.0400000	-.0000000
.08	.0005384	.0800000	-.0000000
.12	.0025431	.1200000	.0000000
.16	.0074816	.1600000	-.0000000
.20	.0169600	.2000000	-.0000000
.24	.0325671	.2400000	.0000000
.28	.0557124	.2800000	.0000000
.32	.0874932	.3200000	-.0000000
.36	.1285914	.3600000	.0000000
.40	.1792000	.4000000	-.0000000
.44	.2389786	.4400000	-.0000000
.48	.3070388	.4800000	-.0000000
.52	.3819588	.5200000	.0000000
.56	.4618279	.5600000	-.0000000
.60	.5443200	.6000000	-.0000000
.64	.6267968	.6400000	.0000000
.68	.7064407	.6800000	.0000000
.72	.7804168	.7200000	.0000000
.76	.8460648	.7600000	.0000000
.80	.9011200	.8000000	.0000000
.84	.9439641	.8399999	.0000001
.88	.9739053	.8800000	.0000000
.92	.9914879	.9200000	.0000000
.96	.9988316	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 4.5 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000086	.0400001	-.0000001
.08	.0001809	.0800000	-.0000000
.12	.0010447	.1200000	.0000000
.16	.0035420	.1600000	.0000000
.20	.0089586	.2000000	-.0000000
.24	.0188019	.2400000	.0000000
.28	.0346555	.2799999	.0000001
.32	.0580245	.3200000	-.0000000
.36	.0901833	.3600000	.0000000
.40	.1320365	.4000000	-.0000000
.44	.1839991	.4400000	-.0000000
.48	.2459036	.4800000	.0000000
.52	.3169394	.5200000	.0000000
.56	.3956300	.5600000	-.0000000
.60	.4798533	.6000000	-.0000000
.64	.5669088	.6400000	-.0000000
.68	.6536362	.6800000	.0000000
.72	.7365897	.7200000	.0000000
.76	.8122711	.7600000	.0000000
.80	.8774259	.8000000	.0000000
.84	.9294054	.8400000	.0000000
.88	.9665977	.8799999	.0000001
.92	.9889319	.9200000	.0000000
.96	.9984571	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A =	5.0 AND B =	3.0	
X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000020	.0400000	-.0000000
.08	.0000600	.0800000	-.0000000
.12	.0004234	.1200000	.0000000
.16	.0016551	.1600000	-.0000000
.20	.0046720	.2000000	-.0000000
.24	.0107209	.2399999	.0000001
.28	.0212996	.2800000	-.0000000
.32	.0380373	.3200000	-.0000000
.36	.0625462	.3600000	.0000000
.40	.0962560	.4000000	-.0000000
.44	.1402448	.4400000	-.0000000
.48	.1950779	.4800000	.0000000
.52	.2606679	.5200000	.0000000
.56	.3361667	.5600000	-.0000000
.60	.4199040	.6000000	-.0000000
.64	.5093831	.6400000	.0000000
.68	.6013469	.6800000	-.0000000
.72	.6919265	.7200000	.0000000
.76	.7768850	.7600000	.0000000
.80	.8519680	.8000000	.0000000
.84	.9133749	.8400000	.0000000
.88	.9583612	.8800000	.0000000
.92	.9859860	.9199999	.0000001
.96	.9980162	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A =	5.5 AND B =	3.0	
X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000005	.0400000	-.0000000
.08	.0000196	.0800000	-.0000000
.12	.0001697	.1200000	.0000000
.16	.0007647	.1599999	.0000001
.20	.0024099	.2000000	-.0000000
.24	.0060481	.2400000	.0000000
.28	.0129558	.2800000	.0000000
.32	.0246859	.3200000	-.0000000
.36	.0429610	.3600000	.0000000
.40	.0695236	.4000000	-.0000000
.44	.1059537	.4400001	-.0000001
.48	.1534675	.4800000	.0000000
.52	.2127113	.5200000	-.0000000
.56	.2835701	.5600000	-.0000000
.60	.3650098	.6000000	-.0000000
.64	.4549745	.6399999	.0000001
.68	.5503634	.6800000	-.0000000
.72	.6471117	.7200000	.0000000
.76	.7404022	.7600000	.0000000
.80	.8250368	.8000000	.0000000
.84	.8959964	.8400000	.0000000
.88	.9492212	.8800000	.0000000
.92	.9826432	.9199999	.0000001
.96	.9975051	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	.0400001	-.0000001
.08	.0000064	.0800000	-.0000000
.12	.0000673	.1200000	.0000000
.16	.0003499	.1600000	-.0000000
.20	.0012314	.2000000	-.0000000
.24	.0033805	.2400000	.0000000
.28	.0078097	.2799999	.0000001
.32	.0158811	.3200000	-.0000000
.36	.0292594	.3600000	.0000000
.40	.0498074	.4000000	-.0000000
.44	.0794247	.4400000	.0000000
.48	.1198402	.4800000	.0000000
.52	.1723681	.5200000	-.0000000
.56	.2376483	.5600000	.0000000
.60	.3153946	.6000000	-.0000000
.64	.4041805	.6400000	-.0000000
.68	.5012977	.6800000	-.0000000
.72	.6027284	.7200000	.0000000
.76	.7032777	.7600000	.0000000
.80	.7969178	.8000000	.0000000
.84	.8774020	.8400000	.0000000
.88	.9392108	.8800000	.0000000
.92	.9788995	.9199999	.0000001
.96	.9969203	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000020	.0800000	-.0000000
.12	.0000265	.1199999	.0000001
.16	.0001588	.1600000	-.0000000
.20	.0006240	.2000000	-.0000000
.24	.0018742	.2400000	.0000000
.28	.0046704	.2800000	.0000000
.32	.0101381	.3200000	-.0000000
.36	.0197791	.3600000	.0000000
.40	.0354256	.4000000	-.0000000
.44	.0591265	.4400000	.0000000
.48	.0929639	.4800000	.0000000
.52	.1388041	.5200000	-.0000000
.56	.1979971	.5600000	.0000000
.60	.2710469	.6000000	-.0000000
.64	.3572863	.6400000	-.0000000
.68	.4546013	.6800000	-.0000000
.72	.5592605	.7200000	.0000000
.76	.6659199	.7600000	.0000000
.80	.7678851	.8000000	.0000000
.84	.8577280	.8400000	.0000000
.88	.9283694	.8800000	.0000000
.92	.9747537	.9200000	.0000000
.96	.9962588	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000007	.0800000	-.0000000
.12	.0000103	.1200000	-.0000000
.16	.0000715	.1600000	.0000000
.20	.0003139	.2000000	-.0000000
.24	.0010316	.2400000	-.0000000
.28	.0027735	.2800000	.0000000
.32	.0064277	.3200001	-.0000001
.36	.0132818	.3600000	.0000000
.40	.0250348	.4000000	-.0000000
.44	.0437436	.4400000	.0000000
.48	.0716881	.4800000	.0000000
.52	.1111469	.5200000	-.0000000
.56	.1640878	.5600000	.0000000
.60	.2317870	.6000000	-.0000000
.64	.3144075	.6400000	-.0000000
.68	.4105864	.6800001	-.0000001
.72	.5170982	.7200000	.0000000
.76	.6286889	.7600000	-.0000000
.80	.7381975	.8000000	.0000000
.84	.8371123	.8400000	.0000000
.88	.9167411	.8800000	.0000000
.92	.9702068	.9200000	.0000000
.96	.9955176	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800001	-.0000001
.12	.0000040	.1200000	-.0000000
.16	.0000320	.1600000	.0000000
.20	.0001568	.2000000	-.0000000
.24	.0005642	.2400000	-.0000000
.28	.0016367	.2800000	.0000000
.32	.0040504	.3200000	.0000000
.36	.0088658	.3600000	-.0000000
.40	.0175898	.4000000	-.0000000
.44	.0321828	.4400000	.0000000
.48	.0549862	.4800000	.0000000
.52	.0885472	.5200000	-.0000000
.56	.1353313	.5600000	.0000000
.60	.1973221	.6000000	-.0000000
.64	.2755288	.6400000	-.0000000
.68	.3694467	.6800000	.0000000
.72	.4765453	.7200000	.0000000
.76	.5918960	.7600000	.0000000
.80	.7080955	.8000000	.0000000
.84	.8150916	.8400000	.0000000
.88	.9043738	.8800000	.0000000
.92	.9652621	.9200000	.0000000
.96	.9946942	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000015	.1200001	-.0000001
.16	.0000142	.1600000	.0000000
.20	.0000779	.2000000	-.0000000
.24	.0003068	.2400000	-.0000000
.28	.0009605	.2799999	.0000001
.32	.0025384	.3200000	.0000000
.36	.0058864	.3600000	-.0000000
.40	.0122946	.4000000	-.0000000
.44	.0235583	.4400000	.0000000
.48	.0419713	.4800000	-.0000000
.52	.0702161	.5200000	-.0000000
.56	.1111243	.5600000	.0000000
.60	.1672898	.6000000	-.0000000
.64	.2405373	.6400000	-.0000000
.68	.3312788	.6800000	.0000000
.72	.4378290	.7200000	.0000000
.76	.5558051	.7600000	-.0000000
.80	.6777995	.8000000	.0000000
.84	.7935995	.8400000	.0000000
.88	.8913182	.8800000	.0000000
.92	.9599246	.9200000	.0000000
.96	.9937863	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000006	.1200000	.0000000
.16	.0000063	.1600000	-.0000000
.20	.0000385	.2000000	-.0000000
.24	.0001660	.2400000	.0000000
.28	.0005608	.2800000	.0000000
.32	.0015829	.3200000	.0000000
.36	.0038893	.3600000	-.0000000
.40	.0085529	.4000000	-.0000000
.44	.0171662	.4400000	.0000000
.48	.0318958	.4800000	-.0000000
.52	.0554447	.5200000	-.0000000
.56	.0908804	.5599999	.0000001
.60	.1412913	.6000000	-.0000000
.64	.2092507	.6400000	-.0000000
.68	.2961002	.6800000	.0000000
.72	.4011090	.7200000	.0000000
.76	.5206356	.7600000	-.0000000
.80	.6475088	.8000000	.0000000
.84	.7709649	.8400000	.0000000
.88	.8776267	.8800000	.0000000
.92	.9542011	.9200000	.0000000
.96	.9927917	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 3.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000002	.1200000	.0000000
.16	.0000028	.1600000	.0000000
.20	.0000189	.2000000	-.0000000
.24	.0000894	.2400000	.0000000
.28	.0003259	.2800000	.0000000
.32	.0009826	.3200000	.0000000
.36	.0025585	.3600000	.0000000
.40	.0059245	.4000000	-.0000000
.44	.0124564	.4399999	.0000001
.48	.0241413	.4800000	-.0000000
.52	.0436112	.5200000	-.0000000
.56	.0740499	.5600000	.0000000
.60	.1189168	.6000000	-.0000000
.64	.1814410	.6400001	-.0000001
.68	.2638673	.6800000	.0000000
.72	.3664868	.7199999	.0000001
.76	.4865654	.7600000	-.0000000
.80	.6174015	.8000000	-.0000000
.84	.7479110	.8400000	.0000000
.88	.8633530	.8799999	.0000001
.92	.9481000	.9200000	.0000000
.96	.9917087	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 3.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0002203	.0400000	-.0000000
.08	.0022981	.0800000	-.0000000
.12	.0087361	.1200000	.0000000
.16	.0219331	.1599999	.0000001
.20	.0438115	.2000000	-.0000000
.24	.0756422	.2400000	.0000000
.28	.1179749	.2800000	.0000000
.32	.1706364	.3199999	.0000001
.36	.2327766	.3600000	-.0000000
.40	.3029507	.4000000	-.0000000
.44	.3792263	.4400000	.0000000
.48	.4593106	.4800000	-.0000000
.52	.5406894	.5199999	.0000001
.56	.6207737	.5600000	.0000000
.60	.6970493	.6000000	.0000000
.64	.7672234	.6400000	.0000000
.68	.8293636	.6800000	.0000000
.72	.8820251	.7200000	.0000000
.76	.9243578	.7600000	.0000000
.80	.9561885	.8000000	.0000000
.84	.9780669	.8400000	.0000000
.88	.9912639	.8800000	.0000000
.92	.9977019	.9200000	.0000000
.96	.9997797	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000554	.0400000	-.0000000
.08	.0008148	.0800000	-.0000000
.12	.0037833	.1200000	.0000000
.16	.0109358	.1600000	-.0000000
.20	.0243445	.2000000	-.0000000
.24	.0458824	.2400000	.0000000
.28	.0769977	.2800000	.0000000
.32	.1185560	.3200000	-.0000000
.36	.1707450	.3600000	.0000000
.40	.2330378	.4000000	-.0000000
.44	.3042096	.4400000	-.0000000
.48	.3824026	.4800000	-.0000000
.52	.4652335	.5200000	.0000000
.56	.5499371	.5600000	-.0000000
.60	.6335401	.6000000	.0000000
.64	.7130571	.6399999	.0000001
.68	.7857007	.6800000	.0000000
.72	.8490958	.7199999	.0000001
.76	.9014873	.7600000	.0000000
.80	.9419266	.8000000	.0000000
.84	.9704207	.8400000	.0000000
.88	.9880178	.8800000	.0000000
.92	.9967956	.9200000	.0000000
.96	.9996878	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 4.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000137	.0400000	-.0000000
.08	.0002835	.0800000	-.0000000
.12	.0016086	.1200000	.0000000
.16	.0053559	.1600000	.0000000
.20	.0132951	.2000000	-.0000000
.24	.0273697	.2400000	.0000000
.28	.0494530	.2800000	.0000000
.32	.0811167	.3200000	-.0000000
.36	.1234311	.3600000	.0000000
.40	.1768110	.4000000	-.0000000
.44	.2409160	.4400000	-.0000000
.48	.3146107	.4800001	-.0000001
.52	.3959896	.5200000	.0000000
.56	.4824635	.5599999	.0000001
.60	.5709099	.6000000	.0000000
.64	.6578780	.6400000	.0000000
.68	.7398441	.6800000	.0000000
.72	.8135034	.7200000	.0000000
.76	.8760855	.7600000	.0000000
.80	.9256723	.8000000	.0000000
.84	.9614898	.8400000	.0000000
.88	.9841365	.8800000	.0000000
.92	.9956874	.9200000	.0000000
.96	.9995730	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000033	.0400000	-.0000000
.08	.0000971	.0800000	-.0000000
.12	.0006733	.1199999	.0000001
.16	.0025836	.1599999	.0000001
.20	.0071543	.2000000	-.0000000
.24	.0160946	.2400000	.0000000
.28	.0313267	.2800000	-.0000000
.32	.0547699	.3200000	-.0000000
.36	.0881060	.3600000	.0000000
.40	.1325496	.4000000	-.0000000
.44	.1886478	.4400000	-.0000000
.48	.2561263	.4800000	.0000000
.52	.3338009	.5200000	.0000000
.56	.4195659	.5600000	-.0000000
.60	.5104678	.6000000	-.0000000
.64	.6028717	.6400000	.0000000
.68	.6927172	.6800000	.0000000
.72	.7758592	.7200000	.0000000
.76	.8484796	.7600000	.0000000
.80	.9075463	.8000000	.0000000
.84	.9512833	.8400000	.0000000
.88	.9795959	.8800000	.0000000
.92	.9943616	.9200000	.0000000
.96	.9994327	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000008	.0400000	-.0000000
.08	.0000328	.0800000	-.0000000
.12	.0002781	.1200000	.0000000
.16	.0012301	.1600000	.0000000
.20	.0038011	.2000000	-.0000000
.24	.0093480	.2400000	.0000000
.28	.0196079	.2800001	-.0000001
.32	.0365558	.3200000	-.0000000
.36	.0621977	.3600000	.0000000
.40	.0983242	.4000000	-.0000000
.44	.1462503	.4400000	-.0000000
.48	.2065682	.4800000	.0000000
.52	.2789436	.5200000	.0000000
.56	.3619799	.5600000	-.0000000
.60	.4531796	.6000000	-.0000000
.64	.5490186	.6400000	.0000000
.68	.6451523	.6800000	.0000000
.72	.7367590	.7200000	.0000000
.76	.8190168	.7600000	.0000000
.80	.8876964	.8000000	.0000000
.84	.9398290	.8400000	.0000000
.88	.9743798	.8800000	.0000000
.92	.9928043	.9200000	.0000000
.96	.9992644	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000002	.0400000	-.0000000
.08	.0000109	.0800000	-.0000000
.12	.0001135	.1200000	.0000000
.16	.0005790	.1600000	-.0000000
.20	.0019973	.2000000	-.0000000
.24	.0053710	.2400000	.0000000
.28	.0121448	.2800000	.0000000
.32	.0241525	.3200000	-.0000000
.36	.0434809	.3600000	.0000000
.40	.0722568	.4000000	-.0000000
.44	.1123770	.4400001	-.0000001
.48	.1652073	.4800000	.0000000
.52	.2312835	.5200000	-.0000000
.56	.3100540	.5600000	-.0000000
.60	.3997027	.6000000	-.0000000
.64	.4970937	.6400000	.0000000
.68	.5978740	.6800001	-.0000001
.72	.6967636	.7200000	.0000000
.76	.7880508	.7600000	.0000000
.80	.8662899	.8000000	.0000000
.84	.9271702	.8399999	.0000001
.88	.9684790	.8800000	.0000000
.92	.9910028	.9200000	.0000000
.96	.9990655	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000036	.0800000	-.0000000
.12	.0000459	.1200000	.0000000
.16	.0002699	.1600000	.0000000
.20	.0010393	.2000000	-.0000000
.24	.0030568	.2400000	.0000000
.28	.0074529	.2800000	.0000000
.32	.0158148	.3200000	-.0000000
.36	.0301336	.3600000	.0000000
.40	.0526591	.4000000	-.0000000
.44	.0856642	.4400000	.0000000
.48	.1311349	.4800000	.0000000
.52	.1904142	.5200000	-.0000000
.56	.2638405	.5600000	.0000000
.60	.3504332	.6000000	-.0000000
.64	.4476803	.6400000	-.0000000
.68	.5514935	.6800000	-.0000000
.72	.6563866	.7200000	.0000000
.76	.7559300	.7600000	.0000000
.80	.8435064	.8000000	.0000000
.84	.9133635	.8400000	.0000000
.88	.9618912	.8800000	.0000000
.92	.9889462	.9200000	.0000000
.96	.9988334	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000012	.0800000	-.0000000
.12	.0000184	.1200000	-.0000000
.16	.0001247	.1600000	-.0000000
.20	.0005361	.2000000	-.0000000
.24	.0017250	.2400000	-.0000000
.28	.0045360	.2800000	-.0000000
.32	.0102727	.3200001	-.0000001
.36	.0207221	.3600000	.0000000
.40	.0380908	.4000000	-.0000000
.44	.0648349	.4400000	.0000000
.48	.1033824	.4800000	.0000000
.52	.1557624	.5200000	-.0000000
.56	.2231746	.5600000	.0000000
.60	.3055524	.6000000	-.0000000
.64	.4011884	.6400000	-.0000000
.68	.5065084	.6800000	-.0000000
.72	.6160861	.7200000	.0000000
.76	.7229891	.7599999	.0000001
.80	.8195326	.8000000	.0000000
.84	.8984757	.8400000	.0000000
.88	.9546199	.8800000	.0000000
.92	.9866251	.9200000	.0000000
.96	.9985659	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000004	.0800001	-.0000001
.12	.0000073	.1200000	-.0000000
.16	.0000571	.1600000	-.0000000
.20	.0002744	.2000000	-.0000000
.24	.0009662	.2400000	-.0000000
.28	.0027404	.2799999	.0000001
.32	.0066249	.3200000	.0000000
.36	.0141509	.3600000	-.0000000
.40	.0273677	.4000000	-.0000000
.44	.0487533	.4400000	.0000000
.48	.0810007	.4800000	.0000000
.52	.1266730	.5200000	-.0000000
.56	.1877447	.5600000	.0000000
.60	.2650746	.6000000	-.0000000
.64	.3578791	.6400000	-.0000000
.68	.4633101	.6800000	-.0000000
.72	.5762616	.7200000	.0000000
.76	.6895432	.7600000	.0000000
.80	.7945574	.8000000	.0000000
.84	.8825820	.8400000	.0000000
.88	.9466743	.8799999	.0000001
.92	.9840316	.9200000	.0000000
.96	.9982606	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	.0800000	-.0000000
.12	.0000029	.1200001	-.0000001
.16	.0000260	.1600000	.0000000
.20	.0001395	.2000000	-.0000000
.24	.0005375	.2400000	-.0000000
.28	.0016447	.2800001	-.0000001
.32	.0042448	.3200000	.0000000
.36	.0096028	.3600000	-.0000000
.40	.0195436	.4000000	-.0000000
.44	.0364455	.4400000	.0000000
.48	.0631079	.4800000	.0000000
.52	.1024660	.5200000	-.0000000
.56	.1571463	.5600000	.0000000
.60	.2288871	.6000000	-.0000000
.64	.3178877	.6400000	-.0000000
.68	.4221910	.6800000	.0000000
.72	.5372527	.7200000	.0000000
.76	.6558826	.7600000	.0000000
.80	.7687675	.8000000	.0000000
.84	.8657638	.8400000	.0000000
.88	.9380682	.8800000	.0000000
.92	.9811592	.9200000	.0000000
.96	.9979152	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000011	.1200000	.0000000
.16	.0000118	.1600000	-.0000000
.20	.0000705	.2000000	-.0000000
.24	.0002972	.2400000	.0000000
.28	.0009811	.2800000	-.0000000
.32	.0027039	.3200000	.0000000
.36	.0064792	.3600000	-.0000000
.40	.0138789	.4000000	-.0000000
.44	.0270989	.4400000	.0000000
.48	.0489148	.4800000	-.0000000
.52	.0824791	.5200000	-.0000000
.56	.1309266	.5600000	.0000000
.60	.1967878	.6000000	-.0000000
.64	.2812486	.6400000	-.0000000
.68	.3833571	.6800000	.0000000
.72	.4993415	.7200000	.0000000
.76	.6222712	.7600000	-.0000000
.80	.7423451	.8000000	.0000000
.84	.8481068	.8400000	.0000000
.88	.9288198	.8800000	.0000000
.92	.9780030	.9200000	.0000000
.96	.9975274	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 3.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000004	.1200000	.0000000
.16	.0000053	.1600000	.0000000
.20	.0000354	.2000000	-.0000000
.24	.0001634	.2400000	.0000000
.28	.0005821	.2800000	.0000000
.32	.0017131	.3200000	.0000000
.36	.0043489	.3600000	.0000000
.40	.0098063	.4000000	-.0000000
.44	.0200506	.4400000	.0000000
.48	.0377350	.4800000	-.0000000
.52	.0660912	.5200000	-.0000000
.56	.1086154	.5600000	.0000000
.60	.1685133	.6000000	-.0000000
.64	.2479152	.6400000	-.0000000
.68	.3469377	.6800000	.0000000
.72	.4627551	.7200000	.0000000
.76	.5889439	.7600000	.0000000
.80	.7154642	.8000000	.0000000
.84	.8296990	.8400000	.0000000
.88	.9189509	.8800000	.0000000
.92	.9745591	.9200000	.0000000
.96	.9970952	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 4.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000813	.0400000	-.0000000
.08	.0011763	.0800000	-.0000000
.12	.0053693	.1200000	.0000000
.16	.0152503	.1600000	-.0000000
.20	.0333440	.2000000	-.0000000
.24	.0616955	.2400000	.0000000
.28	.1015962	.2800000	.0000000
.32	.1534344	.3200000	-.0000000
.36	.2166517	.3600001	-.0000001
.40	.2897920	.4000000	-.0000000
.44	.3706237	.4399999	.0000001
.48	.4563199	.4800000	-.0000000
.52	.5436801	.5200000	.0000000
.56	.6293763	.5600000	.0000000
.60	.7102080	.6000000	.0000000
.64	.7833483	.6400000	.0000000
.68	.8465656	.6800000	.0000000
.72	.8984038	.7200000	.0000000
.76	.9383045	.7600000	.0000000
.80	.9666560	.8000000	.0000000
.84	.9847497	.8400000	.0000000
.88	.9946307	.8800000	.0000000
.92	.9988237	.9200000	.0000000
.96	.9999187	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.5 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000207	.0400000	-.0000000
.08	.0004228	.0800000	-.0000000
.12	.0023572	.1200000	.0000000
.16	.0077080	.1600000	.0000000
.20	.0187815	.2000000	-.0000000
.24	.0379325	.2400000	.0000000
.28	.0672052	.2800000	.0000000
.32	.1080324	.3200000	-.0000000
.36	.1610168	.3600000	.0000000
.40	.2258059	.4000000	-.0000000
.44	.3010672	.4400000	-.0000000
.48	.3845578	.4800000	-.0000000
.52	.4732815	.5200000	.0000000
.56	.5637198	.5600000	.0000000
.60	.6521187	.6000000	.0000000
.64	.7348104	.6400000	.0000000
.68	.8085455	.6800000	.0000000
.72	.8708067	.7200000	.0000000
.76	.9200744	.7600000	.0000000
.80	.9560096	.8000000	.0000000
.84	.9795188	.8400000	.0000000
.88	.9926624	.8799999	.0000001
.92	.9983649	.9200000	.0000000
.96	.9998851	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000052	.0400000	-.0000000
.08	.0001493	.0800001	-.0000001
.12	.0010169	.1199999	.0000001
.16	.0038303	.1600000	.0000000
.20	.0104064	.2000000	-.0000000
.24	.0229548	.2400000	.0000000
.28	.0437826	.2800000	-.0000000
.32	.0749644	.3200000	-.0000000
.36	.1180242	.3600000	.0000000
.40	.1736704	.4000000	-.0000000
.44	.2416115	.4400000	-.0000000
.48	.3204741	.4800001	-.0000001
.52	.4078342	.5200000	.0000000
.56	.5003641	.5600000	.0000000
.60	.5940864	.6000000	.0000000
.64	.6847209	.6400000	.0000000
.68	.7680957	.6800000	.0000000
.72	.8405901	.7199999	.0000001
.76	.8995638	.7600000	.0000000
.80	.9437184	.8000000	.0000000
.84	.9733297	.8400000	.0000000
.88	.9902784	.8800000	.0000000
.92	.9977967	.9200000	.0000000
.96	.9998426	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.5 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000013	.0400000	-.0000000
.08	.0000519	.0800000	-.0000000
.12	.0004322	.1200000	.0000000
.16	.0018757	.1600000	.0000000
.20	.0056843	.2000000	-.0000000
.24	.0137004	.2400000	.0000000
.28	.0281456	.2800000	-.0000000
.32	.0513568	.3200000	-.0000000
.36	.0854611	.3600000	.0000000
.40	.1320365	.4000000	-.0000000
.44	.1918036	.4400000	-.0000000
.48	.2643908	.4800000	.0000000
.52	.3482078	.5200000	.0000000
.56	.4404540	.5600000	-.0000000
.60	.5372751	.6000000	.0000000
.64	.6340695	.6400000	.0000000
.68	.7259272	.6800000	.0000000
.72	.8081721	.7199999	.0000001
.76	.8769531	.7599999	.0000001
.80	.9298150	.8000000	.0000000
.84	.9661552	.8400000	.0000000
.88	.9874494	.8800000	.0000000
.92	.9971072	.9200000	.0000000
.96	.9997899	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000003	.0400000	-.0000000
.08	.0000178	.0800000	-.0000000
.12	.0001813	.1200000	.0000000
.16	.0009068	.1600000	.0000000
.20	.0030664	.2000000	-.0000000
.24	.0080784	.2400000	.0000000
.28	.0178821	.2800000	.0000000
.32	.0347877	.3200000	-.0000000
.36	.0612147	.3600000	.0000000
.40	.0993526	.4000000	-.0000000
.44	.1507869	.4400000	-.0000000
.48	.2161445	.4800000	.0000000
.52	.2948105	.5200000	.0000000
.56	.3847691	.5600000	-.0000000
.60	.4826097	.6000000	-.0000000
.64	.5837263	.6400000	.0000000
.68	.6827203	.6800000	.0000000
.72	.7739888	.7200000	.0000000
.76	.8524552	.7600000	.0000000
.80	.9143583	.8000000	.0000000
.84	.9579813	.8400000	.0000000
.88	.9841503	.8800000	.0000000
.92	.9962849	.9200000	.0000000
.96	.9997257	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.5 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	NOT DEFINED	NOT DEFINED
.08	.0000060	.0800000	-.0000000
.12	.0000752	.1200000	.0000000
.16	.0004335	.1600000	.0000000
.20	.0016360	.2000000	-.0000000
.24	.0047125	.2400000	.0000000
.28	.0112435	.2800000	.0000000
.32	.0233281	.3200000	-.0000000
.36	.0434246	.3600000	.0000000
.40	.0740700	.4000000	-.0000000
.44	.1175044	.4400000	.0000000
.48	.1752488	.4800000	.0000000
.52	.2476940	.5199999	.0000001
.56	.3337729	.5600000	-.0000000
.60	.4307838	.6000000	-.0000000
.64	.5344275	.6400000	.0000000
.68	.6391029	.6800000	.0000000
.72	.7384769	.7200000	.0000000
.76	.8263051	.7600000	.0000000
.80	.8974290	.8000000	.0000000
.84	.9488068	.8400000	.0000000
.88	.9803598	.8800000	.0000000
.92	.9953189	.9200000	.0000000
.96	.9996487	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 7.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000020	.0800000	-.0000000
.12	.0000308	.1200000	-.0000000
.16	.0002051	.1600000	.0000000
.20	.0008644	.2000000	-.0000000
.24	.0027228	.2399999	.0000001
.28	.0070039	.2800000	-.0000000
.32	.0155029	.3200000	-.0000000
.36	.0305376	.3600000	.0000000
.40	.0547619	.4000000	-.0000000
.44	.0908427	.4400000	.0000000
.48	.1410272	.4800000	.0000000
.52	.2066520	.5200000	-.0000000
.56	.2876693	.5600001	-.0000001
.60	.3822806	.6000000	-.0000000
.64	.4867716	.6400000	.0000000
.68	.5956374	.6800000	-.0000000
.72	.7020595	.7200000	.0000000
.76	.7987513	.7600000	.0000000
.80	.8791261	.8000000	.0000000
.84	.9386423	.8400000	.0000000
.88	.9760612	.8800000	.0000000
.92	.9941987	.9200000	.0000000
.96	.9995574	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.5 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000007	.0800001	-.0000001
.12	.0000125	.1200000	-.0000000
.16	.0000962	.1600000	.0000000
.20	.0004527	.2000000	-.0000000
.24	.0015598	.2400000	-.0000000
.28	.0043266	.2800000	.0000000
.32	.0102193	.3200001	-.0000001
.36	.0213070	.3600000	.0000000
.40	.0401818	.4000000	-.0000000
.44	.0697243	.4400000	.0000000
.48	.1127123	.4800000	.0000000
.52	.1713036	.5200000	-.0000000
.56	.2464586	.5600000	.0000000
.60	.3373991	.6000000	-.0000000
.64	.4412240	.6400000	-.0000000
.68	.5528130	.6800000	-.0000000
.72	.6651360	.7200000	.0000000
.76	.7700469	.7600000	.0000000
.80	.8595623	.8000000	.0000000
.84	.9275084	.8400000	.0000000
.88	.9712415	.8800000	.0000000
.92	.9929144	.9200000	.0000000
.96	.9994505	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800000	-.0000000
.12	.0000051	.1200000	-.0000000
.16	.0000448	.1600000	-.0000000
.20	.0002352	.2000000	-.0000000
.24	.0008867	.2400000	-.0000000
.28	.0026526	.2800000	-.0000000
.32	.0066870	.3200000	.0000000
.36	.0147609	.3600000	-.0000000
.40	.0292815	.4000000	-.0000000
.44	.0531634	.4400000	.0000000
.48	.0895181	.4800000	.0000000
.52	.1411628	.5200000	-.0000000
.56	.2099895	.5600000	.0000000
.60	.2962843	.6000000	-.0000000
.64	.3981272	.6400000	-.0000000
.68	.5110427	.6800000	-.0000000
.72	.6280749	.7200000	.0000000
.76	.7404442	.7600000	.0000000
.80	.8388608	.8000000	.0000000
.84	.9154354	.8400000	.0000000
.88	.9658920	.8800000	.0000000
.92	.9914567	.9200000	.0000000
.96	.9993266	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.5 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000020	.1200000	.0000000
.16	.0000207	.1600000	.0000000
.20	.0001213	.2000000	-.0000000
.24	.0005005	.2400001	-.0000001
.28	.0016152	.2800000	.0000000
.32	.0043465	.3200000	.0000000
.36	.0101597	.3600000	-.0000000
.40	.0212045	.4000000	-.0000000
.44	.0402918	.4400000	.0000000
.48	.0706877	.4799999	.0000001
.52	.1156913	.5200000	-.0000000
.56	.1780042	.5600000	.0000000
.60	.2589560	.6000000	-.0000000
.64	.3577136	.6400000	-.0000000
.68	.4706649	.6800000	-.0000000
.72	.5912085	.7200000	.0000000
.76	.7101882	.7600000	.0000000
.80	.8171516	.8000000	.0000000
.84	.9024614	.8399999	.0000001
.88	.9600077	.8800000	.0000000
.92	.9898173	.9200000	.0000000
.96	.9991841	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 9.0 AND B = 4.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000008	.1200000	.0000000
.16	.0000095	.1600000	.0000000
.20	.0000622	.2000000	-.0000000
.24	.0002807	.2400000	.0000000
.28	.0009774	.2800000	-.0000000
.32	.0028080	.3200000	.0000000
.36	.0069513	.3600000	-.0000000
.40	.0152673	.4000000	-.0000000
.44	.0303675	.4400000	.0000000
.48	.0555222	.4800000	-.0000000
.52	.0943380	.5200000	-.0000000
.56	.1501761	.5600000	.0000000
.60	.2253373	.6000000	-.0000000
.64	.3201202	.6400000	-.0000000
.68	.4319466	.6800000	.0000000
.72	.5548303	.7200000	.0000000
.76	.6795133	.7600000	.0000000
.80	.7945689	.8000000	.0000000
.84	.8886315	.8400000	.0000000
.88	.9535873	.8800000	.0000000
.92	.9879882	.9200000	.0000000
.96	.9990218	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 4.5 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000302	.0400000	-.0000000
.08	.0006058	.0800000	-.0000000
.12	.0033192	.1200000	.0000000
.16	.0106607	.1600000	.0000000
.20	.0255017	.2000000	-.0000000
.24	.0505405	.2400000	.0000000
.28	.0878253	.2800000	.0000000
.32	.1384093	.3200000	-.0000000
.36	.2021599	.3600000	.0000000
.40	.2777228	.4000000	-.0000000
.44	.3626291	.4400000	-.0000000
.48	.4535226	.4800000	-.0000000
.52	.5464774	.5200000	.0000000
.56	.6373709	.5600000	.0000000
.60	.7222772	.6000000	.0000000
.64	.7978401	.6400000	.0000000
.68	.8615907	.6800000	.0000000
.72	.9121747	.7200000	.0000000
.76	.9494595	.7600000	.0000000
.80	.9744983	.8000000	.0000000
.84	.9893393	.8400000	.0000000
.88	.9966808	.8800000	.0000000
.92	.9993942	.9200000	.0000000
.96	.9999698	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.0 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000078	.0400000	-.0000000
.08	.0002201	.0800001	-.0000001
.12	.0014731	.1199999	.0000001
.16	.0054472	.1600000	.0000000
.20	.0145216	.2000000	-.0000000
.24	.0314141	.2400000	.0000000
.28	.0587293	.2799999	.0000001
.32	.0985090	.3200000	-.0000000
.36	.1518561	.3600000	.0000000
.40	.2186823	.4000000	-.0000000
.44	.2976060	.4400000	-.0000000
.48	.3860105	.4800000	-.0000000
.52	.4802544	.5200000	.0000000
.56	.5760114	.5600000	.0000000
.60	.6687036	.6000000	.0000000
.64	.7539831	.6400000	.0000000
.68	.8282074	.6799999	.0000001
.72	.8888528	.7200000	.0000000
.76	.9348064	.7600000	.0000000
.80	.9664840	.8000000	.0000000
.84	.9857306	.8400000	.0000000
.88	.9954772	.8800000	.0000000
.92	.9991600	.9200000	.0000000
.96	.9999574	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.5 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000020	.0400000	-.0000000
.08	.0000786	.0800000	-.0000000
.12	.0006430	.1200000	.0000000
.16	.0027390	.1600001	-.0000001
.20	.0081412	.2000000	-.0000000
.24	.0192342	.2399999	.0000001
.28	.0387088	.2800000	-.0000000
.32	.0691489	.3200000	-.0000000
.36	.1125840	.3600000	.0000000
.40	.1700836	.4000000	-.0000000
.44	.2414569	.4400000	-.0000000
.48	.3251063	.4800000	.0000000
.52	.4180612	.5200000	.0000000
.56	.5161989	.5600000	.0000000
.60	.6146382	.6000000	.0000000
.64	.7082644	.6400000	.0000000
.68	.7923305	.6800000	.0000000
.72	.8630584	.7200000	.0000000
.76	.9181533	.7600000	.0000000
.80	.9571380	.8000000	.0000000
.84	.9814177	.8400000	.0000000
.88	.9940047	.8800000	.0000000
.92	.9988670	.9200000	.0000000
.96	.9999416	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.0 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000005	.0400000	-.0000000
.08	.0000277	.0800000	-.0000000
.12	.0002767	.1200000	.0000000
.16	.0013579	.1600000	.0000000
.20	.0045021	.2000000	-.0000000
.24	.0116214	.2400000	.0000000
.28	.0251885	.2800000	.0000000
.32	.0479466	.3200000	-.0000000
.36	.0824959	.3600000	.0000000
.40	.1308270	.4000000	-.0000000
.44	.1938778	.4400000	-.0000000
.48	.2711929	.4800000	.0000000
.52	.3607484	.5200000	.0000000
.56	.4589901	.5600000	-.0000000
.60	.5611032	.6000000	.0000000
.64	.6615029	.6400000	.0000000
.68	.7545007	.6800000	.0000000
.72	.8350678	.7200000	.0000000
.76	.8995850	.7600000	.0000000
.80	.9464452	.8000000	.0000000
.84	.9763610	.8400000	.0000000
.88	.9922374	.8800000	.0000000
.92	.9985074	.9200000	.0000000
.96	.9999217	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.5 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	.0400000	-.0000000
.08	.0000096	.0800000	-.0000000
.12	.0001175	.1200000	.0000000
.16	.0006649	.1600000	.0000000
.20	.0024597	.2000000	-.0000000
.24	.0069393	.2400000	.0000000
.28	.0162045	.2800000	.0000000
.32	.0328817	.3200000	-.0000000
.36	.0598158	.3600000	.0000000
.40	.0996289	.4000000	-.0000000
.44	.1542130	.4400001	-.0000001
.48	.2242411	.4800000	.0000000
.52	.3087906	.5200000	.0000000
.56	.4051612	.5600000	-.0000000
.60	.5089562	.6000000	-.0000000
.64	.6144541	.6400000	.0000000
.68	.7152626	.6800000	.0000000
.72	.8051903	.7199999	.0000001
.76	.8792197	.7600000	.0000000
.80	.9344117	.8000000	.0000000
.84	.9705290	.8400000	.0000000
.88	.9901511	.8800000	.0000000
.92	.9980733	.9200000	.0000000
.96	.9998973	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.0 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000033	.0800000	-.0000000
.12	.0000494	.1200000	-.0000000
.16	.0003220	.1600000	.0000000
.20	.0013293	.2000000	-.0000000
.24	.0041001	.2400000	.0000000
.28	.0103187	.2800000	.0000000
.32	.0223283	.3200000	-.0000000
.36	.0429607	.3600000	.0000000
.40	.0751853	.4000000	-.0000000
.44	.1216138	.4400000	.0000000
.48	.1839314	.4800000	.0000000
.52	.2623551	.5199999	.0000001
.56	.3552313	.5600000	-.0000000
.60	.4588829	.6000000	-.0000000
.64	.5677897	.6400000	-.0000000
.68	.6751432	.6800000	.0000000
.72	.7737530	.7200000	.0000000
.76	.8572020	.7599999	.0000001
.80	.9210627	.8000000	.0000000
.84	.9638993	.8400000	.0000000
.88	.9877233	.8799999	.0000001
.92	.9975568	.9200000	.0000000
.96	.9998675	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.5 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000011	.0800001	-.0000001
.12	.0000205	.1200000	-.0000000
.16	.0001544	.1600000	-.0000000
.20	.0007115	.2000000	-.0000000
.24	.0023997	.2400000	-.0000000
.28	.0065104	.2800000	-.0000000
.32	.0150271	.3200001	-.0000001
.36	.0305903	.3600000	.0000000
.40	.0562722	.4000000	-.0000000
.44	.0951556	.4400000	.0000000
.48	.1497561	.4800000	.0000000
.52	.2213741	.5200000	-.0000000
.56	.3094980	.5600001	-.0000001
.60	.4114036	.6000000	-.0000000
.64	.5220871	.6400000	.0000000
.68	.6346378	.6799999	.0000001
.72	.7410902	.7200000	.0000000
.76	.8336973	.7600000	.0000000
.80	.9064408	.8000000	.0000000
.84	.9564575	.8400000	.0000000
.88	.9849339	.8799999	.0000001
.92	.9969500	.9200000	.0000000
.96	.9998318	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.0 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000004	.0800000	-.0000000
.12	.0000085	.1200000	-.0000000
.16	.0000734	.1600000	.0000000
.20	.0003775	.2000000	-.0000000
.24	.0013925	.2400000	-.0000000
.28	.0040734	.2800000	.0000000
.32	.0100315	.3200000	.0000000
.36	.0216116	.3600000	-.0000000
.40	.0418003	.4000000	-.0000000
.44	.0739195	.4400000	.0000000
.48	.1211032	.4800000	.0000000
.52	.1856083	.5200000	-.0000000
.56	.2680739	.5600000	.0000000
.60	.3668846	.6000000	-.0000000
.64	.4778250	.6399999	.0000001
.68	.5941985	.6800000	-.0000000
.72	.7075329	.7200000	.0000000
.76	.8088854	.7600000	.0000000
.80	.8906036	.8000000	.0000000
.84	.9481976	.8400000	.0000000
.88	.9817647	.8800000	.0000000
.92	.9962450	.9200000	.0000000
.96	.9997894	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.5 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	.0800000	-.0000000
.12	.0000035	.1200000	.0000000
.16	.0000346	.1600000	.0000000
.20	.0001987	.2000000	-.0000000
.24	.0008018	.2400000	-.0000000
.28	.0025293	.2800000	.0000000
.32	.0066473	.3200000	.0000000
.36	.0151592	.3600000	-.0000000
.40	.0308362	.4000000	-.0000000
.44	.0570439	.4400000	.0000000
.48	.0973187	.4800000	.0000000
.52	.1547045	.5200000	-.0000000
.56	.2309266	.5600000	.0000000
.60	.3255573	.6000000	-.0000000
.64	.4353853	.6400000	-.0000000
.68	.5542280	.6800001	-.0000001
.72	.6734006	.7200000	.0000000
.76	.7829551	.7600000	.0000000
.80	.8736217	.8000000	.0000000
.84	.9391214	.8400000	.0000000
.88	.9782002	.8800000	.0000000
.92	.9954342	.9200000	.0000000
.96	.9997396	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 9.0 AND B = 4.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000000	NOT DEFINED	NOT DEFINED
.12	.0000014	.1200000	.0000000
.16	.0000162	.1600000	-.0000000
.20	.0001038	.2000000	-.0000000
.24	.0004584	.2400000	.0000000
.28	.0015597	.2800000	.0000000
.32	.0043750	.3200000	.0000000
.36	.0105635	.3600000	-.0000000
.40	.0226039	.4000000	-.0000000
.44	.0437529	.4400000	.0000000
.48	.0777517	.4799999	.0000001
.52	.1282401	.5200000	-.0000000
.56	.1979122	.5600000	.0000000
.60	.2875361	.6000000	-.0000000
.64	.3950574	.6400000	-.0000000
.68	.5150750	.6800000	-.0000000
.72	.6389951	.7200000	.0000000
.76	.7560994	.7600000	.0000000
.80	.8555758	.8000000	.0000000
.84	.9292379	.8400000	.0000000
.88	.9742270	.8800000	.0000000
.92	.9945101	.9200000	.0000000
.96	.9996817	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 5.0 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000113	.0400000	-.0000000
.08	.0003136	.0800001	-.0000001
.12	.0020615	.1200000	.0000000
.16	.0074847	.1600000	.0000000
.20	.0195814	.2000000	-.0000000
.24	.0415503	.2400000	.0000000
.28	.0761583	.2800000	.0000000
.32	.1251852	.3200000	-.0000000
.36	.1890360	.3600000	.0000000
.40	.2665677	.4000000	-.0000000
.44	.3551423	.4400000	-.0000000
.48	.4508861	.4800000	-.0000000
.52	.5491139	.5200000	.0000000
.56	.6448577	.5600000	.0000000
.60	.7334323	.6000000	.0000000
.64	.8109640	.6400000	.0000000
.68	.8748148	.6800000	.0000000
.72	.9238417	.7200000	.0000000
.76	.9584497	.7600000	.0000000
.80	.9804186	.8000000	.0000000
.84	.9925153	.8400000	.0000000
.88	.9979385	.8800000	.0000000
.92	.9996864	.9199999	.0000001
.96	.9999887	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.5 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000029	.0400000	-.0000000
.08	.0001149	.0800000	-.0000000
.12	.0009230	.1200000	.0000000
.16	.0038587	.1600000	-.0000000
.20	.0112506	.2000000	-.0000000
.24	.0260588	.2399999	.0000001
.28	.0513861	.2800000	-.0000000
.32	.0898962	.3200000	-.0000000
.36	.1432612	.3600000	.0000000
.40	.2117404	.4000000	-.0000000
.44	.2939650	.4400000	-.0000000
.48	.3869611	.4800000	-.0000000
.52	.4864143	.5200000	.0000000
.56	.5871404	.5600000	.0000000
.60	.6837007	.6000000	.0000000
.64	.7710771	.6400000	.0000000
.68	.8453106	.6800000	.0000000
.72	.9040031	.7200000	.0000000
.76	.9465941	.7600000	.0000000
.80	.9743458	.8000000	.0000000
.84	.9900092	.8400000	.0000000
.88	.9971976	.8800000	.0000000
.92	.9995661	.9199999	.0000001
.96	.9999841	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000007	.0400000	-.0000000
.08	.0000415	.0800000	-.0000000
.12	.0004069	.1200000	.0000000
.16	.0019593	.1600000	.0000000
.20	.0063694	.2000000	-.0000000
.24	.0161116	.2400000	.0000000
.28	.0341994	.2800000	-.0000000
.32	.0637149	.3200000	-.0000000
.36	.1072304	.3600000	.0000000
.40	.1662386	.4000000	-.0000000
.44	.2407033	.4400000	-.0000000
.48	.3288205	.4800000	.0000000
.52	.4270483	.5200000	.0000000
.56	.5304187	.5600000	-.0000000
.60	.6331033	.6000000	.0000000
.64	.7291585	.6400000	.0000000
.68	.8133446	.6799999	.0000001
.72	.8818829	.7200000	.0000000
.76	.9330110	.7600000	.0000000
.80	.9672065	.8000000	.0000000
.84	.9869899	.8400000	.0000000
.88	.9962839	.8800000	.0000000
.92	.9994143	.9199999	.0000001
.96	.9999782	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000002	.0400000	-.0000000
.08	.0000147	.0800000	-.0000000
.12	.0001769	.1200000	.0000000
.16	.0009815	.1600000	.0000000
.20	.0035589	.2000000	-.0000000
.24	.0098356	.2400000	.0000000
.28	.0224834	.2800000	.0000000
.32	.0446299	.3200000	-.0000000
.36	.0793658	.3600000	.0000000
.40	.1291382	.4000000	-.0000000
.44	.1951471	.4400000	-.0000000
.48	.2768707	.4800000	.0000000
.52	.3718286	.5200000	.0000000
.56	.4756587	.5600000	-.0000000
.60	.5825339	.6000000	.0000000
.64	.6858833	.6399999	.0000001
.68	.7793242	.6800000	.0000000
.72	.8576558	.7200000	.0000000
.76	.9177247	.7600000	.0000000
.80	.9589624	.8000000	.0000000
.84	.9834168	.8400000	.0000000
.88	.9951771	.8800000	.0000000
.92	.9992263	.9200000	.0000000
.96	.9999707	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000052	.0800000	-.0000000
.12	.0000760	.1200000	-.0000000
.16	.0004858	.1600000	.0000000
.20	.0019654	.2000000	-.0000000
.24	.0059361	.2400000	.0000000
.28	.0146187	.2800000	.0000000
.32	.0309308	.3200000	-.0000000
.36	.0581470	.3600000	.0000000
.40	.0993526	.4000000	-.0000000
.44	.1567813	.4400001	-.0000001
.48	.2311679	.4800000	.0000000
.52	.3212580	.5200000	.0000000
.56	.4236090	.5600000	-.0000000
.60	.5327742	.6000000	.0000000
.64	.6418992	.6400000	.0000000
.68	.7436783	.6800000	.0000000
.72	.8315324	.7200000	.0000000
.76	.9007887	.7600000	.0000000
.80	.9495904	.8000000	.0000000
.84	.9792542	.8400000	.0000000
.88	.9938572	.8800000	.0000000
.92	.9989970	.9200000	.0000000
.96	.9999614	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000018	.0800001	-.0000001
.12	.0000323	.1200000	-.0000000
.16	.0002379	.1600000	.0000000
.20	.0010739	.2000000	-.0000000
.24	.0035460	.2400000	-.0000000
.28	.0094105	.2800000	-.0000000
.32	.0212307	.3200000	-.0000000
.36	.0422081	.3600000	.0000000
.40	.0757644	.4000000	-.0000000
.44	.1249104	.4400000	.0000000
.48	.1915083	.4800000	.0000000
.52	.2755766	.5199999	.0000001
.56	.3748107	.5600000	-.0000000
.60	.4844800	.6000000	-.0000000
.64	.5978059	.6400000	.0000000
.68	.7068406	.6800000	.0000000
.72	.8037502	.7199999	.0000001
.76	.8822820	.7600000	.0000000
.80	.9390824	.8000000	.0000000
.84	.9744715	.8400000	.0000000
.88	.9923048	.8800000	.0000000
.92	.9987213	.9200000	.0000000
.96	.9999499	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000006	.0800000	-.0000000
.12	.0000136	.1200000	-.0000000
.16	.0001153	.1600000	.0000000
.20	.0005812	.2000000	-.0000000
.24	.0020985	.2400000	-.0000000
.28	.0060031	.2800000	.0000000
.32	.0144450	.3200000	.0000000
.36	.0303799	.3600000	.0000000
.40	.0573099	.4000000	-.0000000
.44	.0987553	.4400000	.0000000
.48	.1575100	.4800000	.0000000
.52	.2348123	.5200000	-.0000000
.56	.3296164	.5600000	-.0000000
.60	.4381782	.6000000	-.0000000
.64	.5541413	.6400000	-.0000000
.68	.6692349	.6799999	.0000001
.72	.7745643	.7200000	.0000000
.76	.8623060	.7600000	.0000000
.80	.9274445	.8000000	.0000000
.84	.9690432	.8400000	.0000000
.88	.9905014	.8800000	.0000000
.92	.9983938	.9200000	.0000000
.96	.9999360	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000002	.0800000	-.0000000
.12	.0000057	.1200000	.0000000
.16	.0000554	.1600000	.0000000
.20	.0003119	.2000000	-.0000000
.24	.0012314	.2400000	-.0000000
.28	.0037979	.2800000	-.0000000
.32	.0097495	.3200000	.0000000
.36	.0216971	.3600000	-.0000000
.40	.0430284	.4000000	-.0000000
.44	.0775240	.4400000	.0000000
.48	.1286816	.4800000	.0000000
.52	.1988316	.5200000	-.0000000
.56	.2882158	.5600000	.0000000
.60	.3942704	.6000000	-.0000000
.64	.5113727	.6400000	.0000000
.68	.6312644	.6799999	.0000001
.72	.7442385	.7200000	.0000000
.76	.8409795	.7599999	.0000001
.80	.9146962	.8000000	.0000000
.84	.9629499	.8400000	.0000000
.88	.9884292	.8800000	.0000000
.92	.9980090	.9200000	.0000000
.96	.9999193	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 5.0

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	NOT DEFINED	NOT DEFINED
.12	.0000023	.1200000	.0000000
.16	.0000264	.1600000	.0000000
.20	.0001660	.2000000	-.0000000
.24	.0007170	.2400000	.0000000
.28	.0023846	.2800000	-.0000000
.32	.0065319	.3200000	.0000000
.36	.0153856	.3600000	-.0000000
.40	.0320843	.4000000	-.0000000
.44	.0604581	.4400000	.0000000
.48	.1044764	.4800000	.0000000
.52	.1673846	.5200000	-.0000000
.56	.2506627	.5600000	.0000000
.60	.3530418	.6000000	-.0000000
.64	.4698937	.6400000	-.0000000
.68	.5933026	.6800000	-.0000000
.72	.7130388	.7200000	.0000000
.76	.8184357	.7600000	.0000000
.80	.9008694	.8000000	.0000000
.84	.9561774	.8400000	.0000000
.88	.9860717	.8800000	.0000000
.92	.9975614	.9200000	.0000000
.96	.9998994	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 5.5 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000042	.0400000	-.0000000
.08	.0001630	.0800000	-.0000000
.12	.0012853	.1200000	.0000000
.16	.0052740	.1600000	-.0000000
.20	.0150855	.2000000	-.0000000
.24	.0342613	.2400000	.0000000
.28	.0662141	.2800000	-.0000000
.32	.1134756	.3200000	-.0000000
.36	.1770787	.3600000	.0000000
.40	.2561949	.4000000	-.0000000
.44	.3480884	.4400000	-.0000000
.48	.4483860	.4800000	-.0000000
.52	.5516140	.5200000	.0000000
.56	.6519116	.5599999	.0000001
.60	.7438051	.6000000	.0000000
.64	.8229213	.6400000	.0000000
.68	.8865244	.6800000	.0000000
.72	.9337859	.7200000	.0000000
.76	.9657387	.7600000	.0000000
.80	.9849145	.8000000	.0000000
.84	.9947260	.8400000	.0000000
.88	.9987147	.8800000	.0000000
.92	.9998370	.9200000	.0000000
.96	.9999958	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 6.0 AND B = 5.5			
X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000011	.0400000	-.0000000
.08	.0000602	.0800000	-.0000000
.12	.0005798	.1200000	.0000000
.16	.0027392	.1600000	.0000000
.20	.0087326	.2000000	-.0000000
.24	.0216497	.2400000	.0000000
.28	.0450148	.2800000	-.0000000
.32	.0821043	.3200000	-.0000000
.36	.1352096	.3600000	.0000000
.40	.2050159	.4000000	-.0000000
.44	.2902298	.4400000	-.0000000
.48	.3875414	.4800000	-.0000000
.52	.4919394	.5200000	.0000000
.56	.5973352	.5600000	.0000000
.60	.6973970	.6000000	.0000000
.64	.7864539	.6400000	.0000000
.68	.8603108	.6800000	.0000000
.72	.9168210	.7200000	.0000000
.76	.9560958	.7600000	.0000000
.80	.9802886	.8000000	.0000000
.84	.9929765	.8399999	.0000001
.88	.9982562	.8799999	.0000001
.92	.9997748	.9200000	.0000000
.96	.9999941	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 6.5 AND B = 5.5			
X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000003	.0400000	-.0000000
.08	.0000219	.0800000	-.0000000
.12	.0002577	.1200000	.0000000
.16	.0014024	.1600000	-.0000000
.20	.0049848	.2000000	-.0000000
.24	.0134966	.2400000	.0000000
.28	.0302072	.2800000	.0000000
.32	.0586717	.3200000	-.0000000
.36	.1020304	.3600000	.0000000
.40	.1622553	.4000000	-.0000000
.44	.2395182	.4400000	-.0000000
.48	.3318306	.4800000	.0000000
.52	.4350588	.5200000	.0000000
.56	.5433415	.5600000	-.0000000
.60	.6498656	.6000000	.0000000
.64	.7478732	.6400000	.0000000
.68	.8317207	.6800000	.0000000
.72	.8977792	.7200000	.0000000
.76	.9449742	.7600000	.0000000
.80	.9748140	.8000000	.0000000
.84	.9908546	.8399999	.0000001
.88	.9976871	.8800000	.0000000
.92	.9996959	.9200000	.0000000
.96	.9999918	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 7.0 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000001	NOT DEFINED	NOT DEFINED
.08	.0000079	.0800000	-.0000000
.12	.0001130	.1200000	-.0000000
.16	.0007087	.1600000	-.0000000
.20	.0028100	.2000000	-.0000000
.24	.0083120	.2400000	.0000000
.28	.0200336	.2800000	.0000000
.32	.0414566	.3200000	-.0000000
.36	.0761703	.3600000	.0000000
.40	.1271175	.4000000	-.0000000
.44	.1958048	.4400000	-.0000000
.48	.2816642	.4800000	.0000000
.52	.3817390	.5200000	.0000000
.56	.4908095	.5600000	-.0000000
.60	.6019914	.6000000	.0000000
.64	.7077348	.6400000	.0000000
.68	.8010572	.6799999	.0000001
.72	.8767620	.7200000	.0000000
.76	.9323613	.7600000	.0000000
.80	.9684434	.8000000	.0000000
.84	.9883241	.8400000	.0000000
.88	.9969923	.8800000	.0000000
.92	.9995974	.9200000	.0000000
.96	.9999890	.9599999	.0000001
1.00	1.0000000	1.0000000	0.0000000

A = 7.5 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000028	.0800001	-.0000001
.12	.0000490	.1200000	-.0000000
.16	.0003541	.1600000	.0000000
.20	.0015661	.2000000	-.0000000
.24	.0050630	.2399999	.0000001
.28	.0131455	.2800000	-.0000000
.32	.0289934	.3200000	-.0000000
.36	.0563087	.3600000	.0000000
.40	.0986654	.4000000	-.0000000
.44	.1586751	.4400001	-.0000001
.48	.2371519	.4800000	.0000000
.52	.3324902	.5200000	.0000000
.56	.4404503	.5600000	-.0000000
.60	.5544808	.6000000	.0000000
.64	.6665902	.6400000	.0000000
.68	.7686542	.6800000	.0000000
.72	.8539063	.7200000	.0000000
.76	.9182678	.7600000	.0000000
.80	.9611394	.8000000	.0000000
.84	.9853511	.8400000	.0000000
.88	.9961567	.8800000	.0000000
.92	.9994762	.9200000	.0000000
.96	.9999854	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 8.0 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000010	.0800000	-.0000000
.12	.0000210	.1200000	-.0000000
.16	.0001750	.1600000	-.0000000
.20	.0008640	.2000000	-.0000000
.24	.0030532	.2400000	-.0000000
.28	.0085423	.2800000	.0000000
.32	.0200876	.3200001	-.0000001
.36	.0412527	.3600000	.0000000
.40	.0759272	.4000000	-.0000000
.44	.1275491	.4400000	.0000000
.48	.1981725	.4799999	.0000001
.52	.2875963	.5199999	.0000001
.56	.3928058	.5600000	-.0000000
.60	.5079487	.6000000	-.0000000
.64	.6249673	.6400000	.0000000
.68	.7348624	.6800000	.0000000
.72	.8293778	.7200000	.0000000
.76	.9027270	.7600000	.0000000
.80	.9528754	.8000000	.0000000
.84	.9819039	.8400000	.0000000
.88	.9951650	.8800000	.0000000
.92	.9993292	.9200000	.0000000
.96	.9999810	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

A = 8.5 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000003	.0800000	-.0000000
.12	.0000089	.1200000	.0000000
.16	.0000857	.1600000	-.0000000
.20	.0004722	.2000000	-.0000000
.24	.0018245	.2400000	-.0000000
.28	.0055018	.2800000	.0000000
.32	.0137980	.3200000	.0000000
.36	.0299730	.3600000	-.0000000
.40	.0579679	.4000000	-.0000000
.44	.1017616	.4400000	.0000000
.48	.1644386	.4800000	.0000000
.52	.2471531	.5200000	-.0000000
.56	.3482599	.5600000	-.0000000
.60	.4629114	.6000000	-.0000000
.64	.5833564	.6400000	.0000000
.68	.7000378	.6800000	.0000000
.72	.8033647	.7200000	.0000000
.76	.8857927	.7600000	.0000000
.80	.9436358	.8000000	.0000000
.84	.9779543	.8400000	.0000000
.88	.9940019	.8800000	.0000000
.92	.9991529	.9200000	.0000000
.96	.9999756	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

INCOMPLETE BETA FUNCTION AND INVERSE

A = 9.0 AND B = 5.5

X	BETA(X)	INVERSE XC	ERROR TERM
.04	.0000000	NOT DEFINED	NOT DEFINED
.08	.0000001	.0800000	-.0000000
.12	.0000038	.1200000	.0000000
.16	.0000416	.1600000	.0000000
.20	.0002559	.2000000	-.0000000
.24	.0010811	.2400001	-.0000001
.28	.0035148	.2800000	.0000000
.32	.0094030	.3200000	.0000000
.36	.0216116	.3600000	-.0000000
.40	.0439332	.4000000	-.0000000
.44	.0806232	.4400000	.0000000
.48	.1355537	.4800000	.0000000
.52	.2111053	.5200000	-.0000000
.56	.3070526	.5600000	.0000000
.60	.4197836	.6000000	-.0000000
.64	.5421997	.6400000	-.0000000
.68	.6645304	.6800000	-.0000000
.72	.7760707	.7199999	.0000001
.76	.8675364	.7600000	.0000000
.80	.9334155	.8000000	.0000000
.84	.9734773	.8400000	.0000000
.88	.9926524	.8800000	.0000000
.92	.9989437	.9199999	.0000001
.96	.9999690	.9600000	.0000000
1.00	1.0000000	1.0000000	0.0000000

PEARSON'S INCOMPLETE GAMMA FUNCTION

In the field of hydrology the incomplete gamma function is an extensively used tool for the analyses of flood frequencies and also in the study of time series.

An excellent discussion of the use of the incomplete gamma function as related to flood frequency analyses is found in the American Society of Civil Engineers Transactions, Volume 87, Paper No. 1532, by H. Alden Foster, dated 1924.

The use of the incomplete gamma function can be found in various papers concerning stochastic techniques in time series analyses.

The discussion that follows in the subsequent narrative will be limited to an electronic computer application for the solution of the incomplete gamma function.

The expression generally given for Pearson's Incomplete Gamma Function is as follows:

$$I(u,p) = \frac{1}{\Gamma(p+1)} \int_0^{u\sqrt{p+1}} t^p e^{-t}\, dt = P(x^2/v)$$

where: $x = u\sqrt{p+1}$

$a = p+1$ or $p = a-1$

The expression of the probability function for the solution of a random variable having a value $\leq \chi$ from a gamma function is:

$$P(x \leq \chi) = \frac{b^a}{\Gamma(a)} \int_0^{\chi} t^{a-1} \ell^{-bt} \, dt, \; x \geq 0$$

$$= | - \frac{1}{\Gamma(a)} \int_x^{\infty} \ell^{-t} \, t^{a-1} \, dt$$

which is often written as:

$$P(x \leq \chi) = |- \frac{1}{p(a)} r(a, b-\chi)$$

where "a" and "b" are distribution parameters and r is the incomplete gamma function.

$\Gamma(a)$ is the complete gamma function.

The purpose of this electronic computer application is to design a portable program for the calculation of the incomplete gamma function under five conditions (five algorithms).

$$r(A,x) = \Gamma(A,x) = \int_x^{\infty} \ell^{-u} \, \mu^{A-1} \, du$$

Condition 1 - if A = 0

then:

$$r(0.x) = \Gamma(0.x) = - \left(\gamma + \ell n \; (x) + \sum_{n=0}^{\infty} \frac{(-x)^n}{n.n!} \right)$$

Condition 2 - if A = -N for some positive integer N

then:

$$r(-N,x) = \Gamma(-N,x) = \frac{(-1)^N}{N!}\left(E_1(x) - \ell^{-x}\sum_{j=0}^{N-1}\frac{(-1)^j j!}{x^{j+1}}\right)$$

Condition 3 - if x = 0

$$r(A,0) = \Gamma(A,0) = \int_0^\infty \ell^{-u}\, u^{A-1}\, du = \Gamma(A)$$

Condition 4 - if A≠0 and $x < \sqrt{|A| + 1}$

$$r(A,x) = \Gamma(A,x) = \Gamma(A) - X^A \sum_{n=0}^{\infty}\frac{(-x)^n}{(A+n)n!}$$

Condition 5 - if A≠0 $X \geq \sqrt{|A| + 1}$

$$r(A,x) = \ell^{-x}\, X^A \quad \frac{1}{X+} \quad \frac{1-A}{1+} \quad \frac{2-A}{1+} \quad \frac{2}{X+} \cdots$$

The electronic computer application is a stand alone set of subroutines or functions. The discussion of these various subroutines follows in the subsequent narrative.

PROGRAM GAMINT

This program is simply a little driver that was used to generate values of Pearson's Incomplete Gamma Function in terms of "u" and "p" for comparison with the Tables.

The variable name A is A in $\Gamma(A,x)$ and the variable name X is X in $\Gamma(A,x)$. The variable name U is the transform $X = U\sqrt{P+1}$ and the variable name P is the transform P = A-1.

The variable name COX is $\Gamma(A)$ and CONGAM(A) is the function name used for the solution of the complete gamma.

FUNCTION GAMMA (A,X)

In the function labeled GAMMA the arguments A and X are identical to those described in the previous narrative concerning the five conditions.

The label EULERS is used to store Euler's constant, which is γ is the previous narrative.

It is in the function (FORTRAN terminology) that the various tests are made to determine which condition of algorithm will be used in the solution of the gamma distribution.

Several comments have been included to aid in describing the aforementioned tests.

FUNCTION SMLGAM (A,X)

The function labeled SMLGAM is used to calculate the sum of the following series:

$$S(a,x) = \sum_{n=o}^{n=k} \frac{(-x)^n}{(a+n)n!}$$

where k = 30 provided enough terms in the series such that:

$$\left| S_n(a,x) - S_{n+1}(a,x) \right| \leq 1 \times 10^{-15}$$

This series expansion was used for the solution of Condition 1, i.e. $\Gamma(0,X)$. The series expansion was also used in the solutions of Conditions 2 and 4.

The arguments labeled A and X are self-explanatory.

The label EPSLON represents the absolute difference of the sums n and n+1 in the criteria for the series truncation.

All other labels included in this function labeled SMLGAM are by design self-explanatory.

The series is shown in Reference 1, Chapter 6, Series Developments - 6.5.29, page 262.

FUNCTION CONTER (A,X)

The function labeled CONTER is used for the solution of the following continued fraction:

$$\frac{1}{X+}\ \frac{1-A}{1+}\ \frac{2-A}{1+}\ \frac{2}{X+}\ \cdots$$

where: $X > 0$ and $|A| < \infty$

This series is used as part of the solution for Condition 5. All labels have been designed to be self-explanatory.

The continued fraction is shown in Reference 1, Chapter 6, 6.5.31, page 263.

The arguments A and X are self-explanatory.

FUNCTION CONGAM (ALF)

The function labeled CONGAM is used for the solution of the complete gamma which is often called Euler's Integral. The expression for the complete gamma is as follows:

$$\Gamma(Z) = \int_0^\infty t^{Z-1}\ \ell^{-t}\ dt$$

The recurrence formulas used in the solution of the complete gamma are:

$$\Gamma(Z+1) = Z\Gamma(Z) = Z! + Z(Z-1)!$$

$$\Gamma(n+Z) = (n - 1 + Z)\ (n - 2 + Z)\ \ldots\ (1+Z)Z!$$

The reflection formula used in the solution of the complete gamma is:

$$\Gamma(Z)\Gamma(1-Z) = -Z\Gamma(-Z)\Gamma(Z) = \Pi \text{ CSC } \Pi Z$$

where the fundamental identity for CSC $\Pi Z = 1/\sin \Pi Z$.

The following polynomial approximation along with the above recurrence and reflection formulas are shown in Reference 1, Chapter 6, pages 256 and 257.

$$\Gamma(x+1) = X! = 1 + b,x + b_2X^2 + \ldots + b_8X^8 + \varepsilon(x)$$

where: $0 \leq X \leq |$ and $|\varepsilon(x) \leq 3 \times 10^{-7}$

The coefficients for the above polynomial are:

b_1 =	-0.577191652	b_5 =	-0.756704078
b_2 =	0.988205891	b_6 =	0.482199394
b_3 =	-0.897056937	b_7 =	-0.193527818
b_4 =	0.918206857	b_8 =	0.035868343

All labels are self-explanatory as well as the argument ALF.

FUNCTION GAMNEG (MINUSN,X)

The function GAMNEG is used for the solution of Condition 2. It might be well to reiterate the expression for Condition 2.

$$\Gamma(-N,X) = {}^{(-1)N}/_{N!} \left[E_1(X) - \ell^{-x} \sum_{j=o}^{N-1} \frac{(-1)^j \, j!}{X^{j+1}} \right]$$

where: $E_n(X) = \int_1^{\infty} \ell^{-xt} \, t^{-n} \, dt = X^{n-1} \, \Gamma(1-n,x)$

or:

$$E_1(X) = \int_1^{\infty} \ell^{-xt} \, t^{-1} \, dt = X^{\circ} \, \Gamma(0,x) = \Gamma(X)$$

which is easily recognized as the complete gamma function.

The argument labeled MINUSN is A = -N for some positive integer N.

The expressions as shown above can be found in Reference 1, Chapter 6.

All labels used in the function labeled GAMNEG are self-explanatory.

Error Messages

The error messages are program-generated and are written on the file OUTPUT. The error messages were designed to minimize the system-generated error messages.

REFERENCES

1. Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables, U.S. Department of Commerce, National Bureau of Standards, Applied Mathematics Series 55, Issued June 1964, Fourth Printing, December 1965.

```
      PROGRAM GAMINT(INPUT,OUTPUT,INDAT,OUTA,TAPE5=INDAT,
     1  TAPE6=OUTA)
      COMMON / ABLE / COT, CIT, COX
      INTEGER  COT , CIT
      CIT = 5
      COT = 6
      P = 0.0
   10 U = 0.0
      WRITE (COT , 20)
   20 FORMAT (1H1, 8X )
      DO 100  K = 1, 30
      U = U + 1.E-1
      X = U * SQRT (P + 1.0 )
      A = P + 1.0
      COX = 0.0
      COX = CONGAM (A)
      REF = 0.0
      REF =  COX - GAMMA (A,X)
      REF = REF  / COX
      WRITE ( COT , 50 ) U , P , REF
   50 FORMAT ( 8X, 4HU =  , 3X , F10.6 , 8X, 4HP =   , 3X , F10.6 ,
     1          8X, 9HI(U,P) =     , E19.12  )
  100 CONTINUE
      P = P + 5.E-1
      IF ( P . GE. 10.5 )  CALL EXIT
      GO TO 10
      END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
10214 GAMINT

VARIABLES	SN	TYPE	RELOCATION					
10315	A	REAL		1	CIT	INTEGER		ABLE
0	COT	INTEGER	ABLE	2	COX	REAL		ABLE
10313	K	INTEGER		10311	P	REAL		
10316	REF	REAL		10312	U	REAL		
10314	X	REAL						

FILE NAMES	MODE						
4102	INDAT	0	INPUT	6143	OUTA	2041	OUTPUT
4102	TAPE5	6143	TAPE6				

EXTERNALS	TYPE	ARGS				
CONGAM	REAL	1	EXIT		0	
GAMMA	REAL	2	SQRT	REAL	1	LIBRARY

STATEMENT LABELS
10220 10 10266 20 FMT 10276 50 FMT
0 100

COMMON BLOCKS	LENGTH
ABLE	3

STATISTICS

PROGRAM LENGTH	1138	75
BUFFER LENGTH	10204B	4228
CM LABELED COMMON LENGTH	3B	3

```
      FUNCTION  GAMMA (A,X)
      COMMON / ABLE / COT, CIT ,COX
      INTEGER COT,CIT
      GAMMA = 0.0
 5    EULERS = 5.77215664901533E-1
      IF (A.EQ.0.0.AND.X.EQ.0.0) GO TO 500
      UPDATE = 0.0
      IF (A.LT.0.0) GO TO 40
      IF (A.EQ.0.0) GO TO 30
10    C     THE VALUE OF A IS GREATER THAN ZERO
      IF (A.LE.1.E-10) GO TO 30
      CRP = ABS (X)
    1 IF (CRP.LE.1.E-10) GO TO 20
      C     TEST TO DETERMINE RANGE OF  X WITH RESPECT TO A
15    CRP = ABS (A)
      IF (X.LT.SQRT (CRP + 1.0 ))   GO TO 10
      C     THE VALUE OF X IS GREATER  THAN THE SQROOT OF (ABS(A) +1 )
      C     USE CONTINUED FRACTION TO APPROXIMATE INCOMPLETE GAMMA
      C     INTEGRATING FROM X  TO INFINITY
20    GAMMA = CONTFR (A,X)
      GO TO 500
      C     VALUE OF X IS LESS THAN THE SQROOT OF (ABS(A) + 1)
      C     USE SERIES EXPANSION INTEGRATING  X TO INFINITY
   10 GAMMA = EXP ( A * ALOG (X) ) * SMLGAM ( A, X )
25    GAMMA = COX - GAMMA
      GO TO 500
   20 GAMMA = COX
      GO TO 500
   30 GAMMA = - (EULERS + ALOG (X)+ SMLGAM (0.0 , X))
30    GO TO 500
   40 UPDATE = A + 1.0
      NP = 1
   50 IF (UPDATE.GE.0.0)  GO TO 60
      CRP = ABS (UPDATE)
35    IF (CRP.LE.1.E-10)  GO TO 70
      UPDATE = UPDATE + 1.0
      NP = NP + 1
      GO TO 50
   60 IF (UPDATE.NE.0.0)  GO TO 80
40    70 NS = NP
      GAMMA = GAMNEG (-NS, X )
      GO TO 500
   80 IF (UPDATE.LE.1.E-10)  GO TO 70
      GO TO 1
45  500 RETURN
      END
```

ENTRY POINTS
4 GAMMA

VARIABLES	SN	TYPE	RELOCATION
0	A	REAL	F.P.
0	COT	INTEGER	ABLE
134	CRP	REAL	
131	GAMMA	REAL	
136	NS	INTEGER	
0	X	REAL	F.P.

1	CIT	INTEGER	ABLE				
2	COX	REAL	ABLE				
132	EULERS	REAL					
135	NP	INTEGER					
133	UPDATE	REAL					

EXTERNALS	TYPE	ARGS				
ALOG	REAL	1	LIBRARY	CONTFR	REAL	2
EXP	REAL	1	LIBRARY	GAMNEG	REAL	2
SMLGAM	REAL	2		SQRT	REAL	1 LIBRARY

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS

21	1	35	10	51	20		
53	30	65	40	70	50		
100	60	101	70	107	80		
112	500						

COMMON BLOCKS	LENGTH
ABLE	3

STATISTICS

PROGRAM LENGTH	137B	95
CM LABELED COMMON LENGTH	3B	3

```
FUNCTION SMLGAM     74/74   OPT=1                    FTN 4.2+P380       75/03/17. 09.57.06.

                    FUNCTION  SMLGAM  (A ,X )
                    COMMON / ABLE / COT, CIT, COX                                   PAGE     1
                    INTEGER  COT , CIT
                C   SET INITIAL VALUES FOR SERIES EXPANSION I.E. N = 0  (6.5.29)
  5                 SMLGAM = 0.0
                    IF (A.NE.0.0)  SMLGAM = 1.0 / A
                    ANUM = X
                    PNEXT = 0.0
                    FACTN = 1.0
 10                 SIGN = 1.0
                    EPSLON = 0.0
                    DENOM = 0.0
                    DO 10 K = 1, 30
                    PN = K
 15                 SIGN = - SIGN
                    DENOM =  A+ PN
                    FACTN = FACTN * PN
                    TERM  = 0.0
                    TERM  =  ( SIGN  * ANUM ) / (DENOM * FACTN )
 20                 EPSLON = ABS (TERM)
                    IF (EPSLON.LE.1.E-15)  GO TO  100
                    SMLGAM = SMLGAM + TERM
                    ANUM = ANUM * X
                 10 CONTINUE
 25                 WRITE (COT , 20)  EPSLON , A , X
                 20 FORMAT(1H1, 8X, 35HSERIES FOR SMLGAM DID NOT CONVERGE  /
                   1   8X,  9HEPSLON =  , E19.12 ,4X,4HA = ,E19.12,4X,4HX = ,E19.12 )
                    CALL EXIT
                100 RETURN
 30                 END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 SMLGAM

VARIABLES	SN	TYPE	RELOCATION				
0	A	REAL	F.P.	102	ANUM	REAL	
1	CIT	INTEGER	ABLE	0	COT	INTEGER	ABLE
2	COX	REAL	ABLE	107	DENOM	REAL	
106	EPSLON	REAL		104	FACTN	REAL	
110	K	INTEGER		111	PN	REAL	
103	PNEXT	REAL		105	SIGN	REAL	
101	SMLGAM	REAL		112	TERM	REAL	
0	X	REAL	F.P.				

EXTERNALS	TYPE	ARGS
EXIT		0

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS
0 10 64 20 FMT 54 100

COMMON BLOCKS	LENGTH
ABLE	3

STATISTICS

PROGRAM LENGTH	1178	79
CM LABELED COMMON LENGTH	38	3

```
FUNCTION CONTFR     74/74   OPT=1                          FTN 4.2+P380       75/03/17. 09.57.06.

                    FUNCTION  CONTFR  ( A , X )                                              PAGE     1
                    COMMON / ABLE /  COT , CIT ,COX
                    INTEGER  COT , CIT
               C    SET INITIAL VALUES FOR  CONTINUED FRACTION   (6.5.31)
     5              ANUM = 25.0
                    DENOM = X
                    BNUM = 0.0
                    DO  10  K = 1,30
                    BNUM = ANUM / DENOM
    10              DENOM = BNUM + 1.0
                    BNUM  = ANUM - A
                    BNUM  = BNUM  / DENOM
                    DENOM = BNUM + X
                    ANUM = ANUM - 1.0
    15              IF (ANUM.LE.0.0)  GO TO 100
                 10 CONTINUE
                    WRITE (COT, 20)  ANUM , A , X
                 20 FORMAT (1H1 ,8X ,37HCONTINUED FRACTION -CONTFR- DIVERGES
                   1    8X,  8HANUM =  ,E19.12, 4X, 4HA =  ,E19.12,4X,4HX = , E19.12)
    20              CALL EXIT
                100 CONTFR = EXP (ALOG (X) * A - X ) / DENOM
                    RETURN
                    END
```

ENTRY POINTS
4 CONTFR

VARIABLES	SN	TYPE	RELOCATION				
0	A	REAL	F.P.	64	ANUM	REAL	
66	BNUM	REAL		1	CIT	INTEGER	ABLE
63	CONTFR	REAL		0	COT	INTEGER	ABLE
2	COX	REAL	ABLE	65	DENOM	REAL	
67	K	INTEGER		0	X	REAL	F.P.

EXTERNALS	TYPE	ARGS			
ALOG	REAL	1	LIBRARY	EXIT	0
EXP	REAL	1	LIBRARY		

STATEMENT LABELS
0 10 46 20 FMT 31 100

COMMON BLOCKS	LENGTH
ABLE	3

STATISTICS

PROGRAM LENGTH	70B	56
CM LABELED COMMON LENGTH	3B	3

```
      FUNCTION CONGAM  (ALF )
      COMMON / ABLE / COT, CIT, COX
      INTEGER  COT , CIT
      DIMENSION   BC (8)
 5    DATA((BC (K) , K = 1,8 )  =   -0.577191652 , 0.988205891 ,
     1   -0.897056937  , 0.918206857 ,  - 0.756704078  , 0.482199394,
     2      -0.193527818  ,   0.035868343    )
      PI = 3.14159265358979
      KSW = 1
10    CONGAM = 0.0
      IF ( ALF . GT. 1. E-10  )  GO TO 1
      IF ( ALF . LT. 1. E-10  )  GO TO 5
      CONGAM = 1.0
      GO TO 100
15   5 NCP = ALF
      SAVE = ALF
      ALF1 = ABS (NCP)
      COMP = 0.0
      COMP = ALF + ALF1
20    IF ( ABS (COMP) .GT. 1.E-10 )    GO TO 15
      WRITE ( COT , 10 )
     10 FORMAT ( 8X,  28HALPHA IS A NEGATIVE INTEGER   )
      GO TO 100
     15 KSW = 2
25    ALF = 1.0 - ALF
      IF ( ALF . GT. 1.E-10  )  GO TO 1
      WRITE ( COT , 18 )
     18 FORMAT ( 8X, 30HBAD EQUATION IN TERMS OF ALPHA   )
      CALL EXIT
30   19 ALF = SAVE
      CONGAM = PI / ( CONGAM * SIN ( PI * ALF) )
      GO TO 100
      1 MARK = 1
      FB = 1.0
35    N = ALF
      COMP = 0.0
      COMP = ALF + 1.E-10
      N = COMP
      WRITE ( COT , 8 )   N , ALF
40    8 FORMAT ( 8X, I4 , 8X, E19.12 )
      KN = N - 1
      IF (KN.GE.1)  GO TO 20
      IF ( ALF .LT. 1.0 )  GO TO 9
      X = ALF - 1.0
45    GO TO 40
      9 MARK = 2
      X = ALF
      GO TO 40
     20 DO 30  K = 1, KN
50    FK = K
      FA = 0.0
      FA = ALF - FK
      FB = FB * FA
     30 CONTINUE
55    X = FA - 1.0
      TEST = ABS (X)
      IF (TEST.GE.1.E-9)  GO TO 40
```

```
                      FOFX = 1.0
                      GO TO 60
60                 40 JB = 8
                      FOFX = 0.0
                   50 FOFX = FOFX + BC(JB)
                      FOFX = FOFX * X
                      JB = JB - 1
65                    IF (JB.GT.0)  GO TO 50
                      FOFX = FOFX + 1.0
                   60 CONGAM = FOFX * FB
                      IF (MARK .EQ. 2 ) CONGAM = CONGAM / X
                      IF ( KSW .EQ. 2 )  GO TO 19
70                 100 RETURN
                      END
```

FUNCTION CONGAM 74/74 OPT=1 FTN 4.2+P380 75/03/17. 09.57.07.

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

17 I BASIC EXTERNAL OR INTRINSIC FUNCTION CALLED WITH WRONG TYPE ARGUMENT.

ENTRY POINTS
4 CONGAM

VARIABLES	SN	TYPE	RELOCATION
0	ALF	REAL	F.P.
207	BC	REAL	ARRAY
173	COMP	REAL	
0	COT	INTEGER	ABLE
203	FA	REAL	
202	FK	REAL	
206	JB	INTEGER	
177	KN	INTEGER	
174	MARK	INTEGER	
170	NCP	INTEGER	
171	SAVE	REAL	
200	X	REAL	

172	ALF1	REAL	
1	CIT	INTEGER	ABLE
165	CONGAM	REAL	
2	COX	REAL	ABLE
175	FB	REAL	
205	FOFX	REAL	
201	K	INTEGER	
167	KSW	INTEGER	
176	N	INTEGER	
166	PI	REAL	
204	TEST	REAL	

EXTERNALS	TYPE	ARGS
EXIT		0

SIN	REAL	1	LIBRARY

INLINE FUNCTIONS	TYPE	ARGS	
ABS	REAL	1	INTRIN

STATEMENT LABELS

45	1		16	5		156	8		FMT
64	9		134	10	FMT	30	15		
144	18	FMT	37	19		67	20		
0	30		107	40		111	50		
120	60		130	100					

COMMON BLOCKS	LENGTH
ABLE	3

STATISTICS

PROGRAM LENGTH	2178	143
CM LABELED COMMON LENGTH	38	3

```
      FUNCTION GAMNEG(MINUSN,X)
      EULERS = 0.577215664901533
      N=-MINUSN
      NLESS1 = N - 1
      FACTJ=1.0
      XTERM=X
      J=1
      SUM=1./XTERM
      SIGN=1.
    1 SIGN=-SIGN
      XTERM=XTERM*X
      SUM=SUM+SIGN*FACTJ/XTERM
      J=J+1
      IF (J-NLESS1) 2,2,3
    2 FACTJ = FACTJ*FLOAT(J)
      GO TO 1
    3 FACTN=FACTJ*FLOAT (N)
      SIGN=-SIGN
      E1X=-(EULERS +ALOG(X)+SMLGAM ( 0.0 , X ) )
      GAMNEG=SIGN/FACTN*(E1X-SUM/EXP(X))
      RETURN
      END
```

2 I CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

ENTRY POINTS
4 GAMNEG

VARIABLES	SN	TYPE	RELOCATION				
64	EULERS	REAL		75	E1X	REAL	
67	FACTJ	REAL		74	FACTN	REAL	
63	GAMNEG	REAL		71	J	INTEGER	
0	MINUSN	INTEGER	F.P.	65	N	INTEGER	
66	NLESS1	INTEGER		73	SIGN	REAL	
72	SUM	REAL		0	X	REAL	F.P.
70	XTERM	REAL					

EXTERNALS	TYPE	ARGS					
ALOG	REAL	1	LIBRARY		EXP	REAL	1 LIBRARY
SMLGAM	REAL	2					

INLINE FUNCTIONS	TYPE	ARGS	
FLOAT	REAL	1	INTRIN

STATEMENT LABELS
17 1 0 2 INACTIVE 32 3

STATISTICS
PROGRAM LENGTH 768 62

```
   1          .1000000000000E+01
U =       .100000          P =        0.000000        I(U,P) =    .951625819640E-01
   1          .1000000000000E+01
U =       .200000          P =        0.000000        I(U,P) =    .181269246922E+00
   1          .1000000000000E+01
U =       .300000          P =        0.000000        I(U,P) =    .259181779318E+00
   1          .1000000000000E+01
U =       .400000          P =        0.000000        I(U,P) =    .329679953964E+00
   1          .1000000000000E+01
U =       .500000          P =        0.000000        I(U,P) =    .393469340287E+00
   1          .1000000000000E+01
U =       .600000          P =        0.000000        I(U,P) =    .451188363906E+00
   1          .1000000000000E+01
U =       .700000          P =        0.000000        I(U,P) =    .503414696209E+00
   1          .1000000000000E+01
U =       .800000          P =        0.000000        I(U,P) =    .550671035883E+00
   1          .1000000000000E+01
U =       .900000          P =        0.000000        I(U,P) =    .593430340259E+00
   1          .1000000000000E+01
U =      1.000000          P =        0.000000        I(U,P) =    .632120558829E+00
   1          .1000000000000E+01
U =      1.100000          P =        0.000000        I(U,P) =    .667128916302E+00
   1          .1000000000000E+01
U =      1.200000          P =        0.000000        I(U,P) =    .698805788088E+00
   1          .1000000000000E+01
U =      1.300000          P =        0.000000        I(U,P) =    .727468206966E+00
   1          .1000000000000E+01
U =      1.400000          P =        0.000000        I(U,P) =    .753403036058E+00
   1          .1000000000000E+01
U =      1.500000          P =        0.000000        I(U,P) =    .776869839852E+00
   1          .1000000000000E+01
U =      1.600000          P =        0.000000        I(U,P) =    .798103482005E+00
   1          .1000000000000E+01
U =      1.700000          P =        0.000000        I(U,P) =    .817316475947E+00
   1          .1000000000000E+01
U =      1.800000          P =        0.000000        I(U,P) =    .834701111778E+00
   1          .1000000000000E+01
U =      1.900000          P =        0.000000        I(U,P) =    .850431380777E+00
   1          .1000000000000E+01
U =      2.000000          P =        0.000000        I(U,P) =    .864664716763E+00
   1          .1000000000000E+01
U =      2.100000          P =        0.000000        I(U,P) =    .877543571747E+00
   1          .1000000000000E+01
U =      2.200000          P =        0.000000        I(U,P) =    .889196841638E+00
   1          .1000000000000E+01
U =      2.300000          P =        0.000000        I(U,P) =    .899741156277E+00
   1          .1000000000000E+01
U =      2.400000          P =        0.000000        I(U,P) =    .909282046711E+00
   1          .1000000000000E+01
U =      2.500000          P =        0.000000        I(U,P) =    .917915001376E+00
   1          .1000000000000E+01
U =      2.600000          P =        0.000000        I(U,P) =    .925726421786E+00
   1          .1000000000000E+01
U =      2.700000          P =        0.000000        I(U,P) =    .932794487260E+00
   1          .1000000000000E+01
U =      2.800000          P =        0.000000        I(U,P) =    .939189937375E+00
   1          .1000000000000E+01
U =      2.900000          P =        0.000000        I(U,P) =    .944976779944E+00
   1          .1000000000000E+01
U =      3.000000          P =        0.000000        I(U,P) =    .950212931632E+00
```

```
   1          .150000000000E+01
U =       .100000          P =       .500000        I(U,P) =    .299738381032E-01
   1          .150000000000E+01
U =       .200000          P =       .500000        I(U,P) =    .788948769845E-01
   1          .150000000000E+01
U =       .300000          P =       .500000        I(U,P) =    .135021406834E+00
   1          .150000000000E+01
U =       .400000          P =       .500000        I(U,P) =    .193859394269E+00
   1          .150000000000E+01
U =       .500000          P =       .500000        I(U,P) =    .252924188106E+00
   1          .150000000000E+01
U =       .600000          P =       .500000        I(U,P) =    .310717546602E+00
   1          .150000000000E+01
U =       .700000          P =       .500000        I(U,P) =    .366316687408E+00
   1          .150000000000E+01
U =       .800000          P =       .500000        I(U,P) =    .419164172685E+00
   1          .150000000000E+01
U =       .900000          P =       .500000        I(U,P) =    .468945427412E+00
   1          .150000000000E+01
U =      1.000000          P =       .500000        I(U,P) =    .515511346563E+00
   1          .150000000000E+01
U =      1.100000          P =       .500000        I(U,P) =    .558826751971E+00
   1          .150000000000E+01
U =      1.200000          P =       .500000        I(U,P) =    .598934831444E+00
   1          .150000000000E+01
U =      1.300000          P =       .500000        I(U,P) =    .635932093263E+00
   1          .150000000000E+01
U =      1.400000          P =       .500000        I(U,P) =    .669950017549E+00
   1          .150000000000E+01
U =      1.500000          P =       .500000        I(U,P) =    .701142473508E+00
   1          .150000000000E+01
U =      1.600000          P =       .500000        I(U,P) =    .729675903407E+00
   1          .150000000000E+01
U =      1.700000          P =       .500000        I(U,P) =    .755722500574E+00
   1          .150000000000E+01
U =      1.800000          P =       .500000        I(U,P) =    .779455223888E+00
   1          .150000000000E+01
U =      1.900000          P =       .500000        I(U,P) =    .801044238722E+00
   1          .150000000000E+01
U =      2.000000          P =       .500000        I(U,P) =    .820654425914E+00
   1          .150000000000E+01
U =      2.100000          P =       .500000        I(U,P) =    .838443692722E+00
   1          .150000000000E+01
U =      2.200000          P =       .500000        I(U,P) =    .854561886119E+00
   1          .150000000000E+01
U =      2.300000          P =       .500000        I(U,P) =    .869150157405E+00
   1          .150000000000E+01
U =      2.400000          P =       .500000        I(U,P) =    .882340663108E+00
   1          .150000000000E+01
U =      2.500000          P =       .500000        I(U,P) =    .894256514228E+00
   1          .150000000000E+01
U =      2.600000          P =       .500000        I(U,P) =    .905011906389E+00
   1          .150000000000E+01
U =      2.700000          P =       .500000        I(U,P) =    .914712379103E+00
   1          .150000000000E+01
U =      2.800000          P =       .500000        I(U,P) =    .923455164457E+00
   1          .150000000000E+01
U =      2.900000          P =       .500000        I(U,P) =    .931329594803E+00
   1          .150000000000E+01
U =      3.000000          P =       .500000        I(U,P) =    .938417546306E+00
```

```
   2          .200000000000E+01
U =       .100000          P =       1.000000        I(U,P) =    .910535957631E-02
   2          .200000000000E+01
U =       .200000          P =       1.000000        I(U,P) =    .332005779085E-01
   2          .200000000000E+01
U =       .300000          P =       1.000000        I(U,P) =    .681736779589E-01
   2          .200000000000E+01
U =       .400000          P =       1.000000        I(U,P) =    .110736534404E+00
   2          .200000000000E+01
U =       .500000          P =       1.000000        I(U,P) =    .158279093328E+00
   2          .200000000000E+01
U =       .600000          P =       1.000000        I(U,P) =    .208747713966E+00
   2          .200000000000E+01
U =       .700000          P =       1.000000        I(U,P) =    .260543805562E+00
   2          .200000000000E+01
U =       .800000          P =       1.000000        I(U,P) =    .312439522262E+00
   2          .200000000000E+01
U =       .900000          P =       1.000000        I(U,P) =    .363507779758E+00
   2          .200000000000E+01
U =      1.000000          P =       1.000000        I(U,P) =    .413054282489E+00
   2          .200000000000E+01
U =      1.100000          P =       1.000000        I(U,P) =    .460619610671E+00
   2          .200000000000E+01
U =      1.200000          P =       1.000000        I(U,P) =    .505839722081E+00
   2          .200000000000E+01
U =      1.300000          P =       1.000000        I(U,P) =    .548513482448E+00
   2          .200000000000E+01
U =      1.400000          P =       1.000000        I(U,P) =    .588526057571E+00
   2          .200000000000E+01
U =      1.500000          P =       1.000000        I(U,P) =    .625837185802E+00
   2          .200000000000E+01
U =      1.600000          P =       1.000000        I(U,P) =    .660463506433E+00
   2          .200000000000E+01
U =      1.700000          P =       1.000000        I(U,P) =    .692464252103E+00
   2          .200000000000E+01
U =      1.800000          P =       1.000000        I(U,P) =    .721929725290E+00
   2          .200000000000E+01
U =      1.900000          P =       1.000000        I(U,P) =    .748972073405E+00
   2          .200000000000E+01
U =      2.000000          P =       1.000000        I(U,P) =    .773717956634E+00
   2          .200000000000E+01
U =      2.100000          P =       1.000000        I(U,P) =    .796302769744E+00
   2          .200000000000E+01
U =      2.200000          P =       1.000000        I(U,P) =    .816866135509E+00
   2          .200000000000E+01
U =      2.300000          P =       1.000000        I(U,P) =    .835548434854E+00
   2          .200000000000E+01
U =      2.400000          P =       1.000000        I(U,P) =    .852488178648E+00
   2          .200000000000E+01
U =      2.500000          P =       1.000000        I(U,P) =    .867820059517E+00
   2          .200000000000E+01
U =      2.600000          P =       1.000000        I(U,P) =    .881673550010E+00
   2          .200000000000E+01
U =      2.700000          P =       1.000000        I(U,P) =    .894171936921E+00
   2          .200000000000E+01
U =      2.800000          P =       1.000000        I(U,P) =    .905431701082E+00
   2          .200000000000E+01
U =      2.900000          P =       1.000000        I(U,P) =    .915562168327E+00
   2          .200000000000E+01
U =      3.000000          P =       1.000000        I(U,P) =    .924665370879E+00
```

```
   2          .250000000000E+01
U =       .100000          P =       1.500000          I(U,P) =    .267330444585E-02
   2          .250000000000E+01
U =       .200000          P =       1.500000          I(U,P) =    .135309254562E-01
   2          .250000000000E+01
U =       .300000          P =       1.500000          I(U,P) =    .334022749229E-01
   2          .250000000000E+01
U =       .400000          P =       1.500000          I(U,P) =    .614994481181E-01
   2          .250000000000E+01
U =       .500000          P =       1.500000          I(U,P) =    .964792350408E-01
   2          .250000000000E+01
U =       .600000          P =       1.500000          I(U,P) =    .136843705324E+00
   2          .250000000000E+01
U =       .700000          P =       1.500000          I(U,P) =    .181130047716E+00
   2          .250000000000E+01
U =       .800000          P =       1.500000          I(U,P) =    .228002727155E+00
   2          .250000000000E+01
U =       .900000          P =       1.500000          I(U,P) =    .276294094660E+00
   2          .250000000000E+01
U =      1.000000          P =       1.500000          I(U,P) =    .325016350121E+00
   2          .250000000000E+01
U =      1.100000          P =       1.500000          I(U,P) =    .373357472183E+00
   2          .250000000000E+01
U =      1.200000          P =       1.500000          I(U,P) =    .420668556938E+00
   2          .250000000000E+01
U =      1.300000          P =       1.500000          I(U,P) =    .466446514439E+00
   2          .250000000000E+01
U =      1.400000          P =       1.500000          I(U,P) =    .510316000298E+00
   2          .250000000000E+01
U =      1.500000          P =       1.500000          I(U,P) =    .552010604088E+00
   2          .250000000000E+01
U =      1.600000          P =       1.500000          I(U,P) =    .591355422768E+00
   2          .250000000000E+01
U =      1.700000          P =       1.500000          I(U,P) =    .628251046803E+00
   2          .250000000000E+01
U =      1.800000          P =       1.500000          I(U,P) =    .662659268538E+00
   2          .250000000000E+01
U =      1.900000          P =       1.500000          I(U,P) =    .694590569814E+00
   2          .250000000000E+01
U =      2.000000          P =       1.500000          I(U,P) =    .724093339562E+00
   2          .250000000000E+01
U =      2.100000          P =       1.500000          I(U,P) =    .751244710060E+00
   2          .250000000000E+01
U =      2.200000          P =       1.500000          I(U,P) =    .776142867613E+00
   2          .250000000000E+01
U =      2.300000          P =       1.500000          I(U,P) =    .798900679612E+00
   2          .250000000000E+01
U =      2.400000          P =       1.500000          I(U,P) =    .819640478332E+00
   2          .250000000000E+01
U =      2.500000          P =       1.500000          I(U,P) =    .838489847845E+00
   2          .250000000000E+01
U =      2.600000          P =       1.500000          I(U,P) =    .855578270898E+00
   2          .250000000000E+01
U =      2.700000          P =       1.500000          I(U,P) =    .871034505400E+00
   2          .250000000000E+01
U =      2.800000          P =       1.500000          I(U,P) =    .884984573906E+00
   2          .250000000000E+01
U =      2.900000          P =       1.500000          I(U,P) =    .897550263227E+00
   2          .250000000000E+01
U =      3.000000          P =       1.500000          I(U,P) =    .908848044463E+00
```

```
   3          .300000000000E+01
U =      .100000          P =      2.000000        I(U,P) =   .760958139402E-03
   3          .300000000000E+01
U =      .200000          P =      2.000000        I(U,P) =   .535529738963E-02
   3          .300000000000E+01
U =      .300000          P =      2.000000        I(U,P) =   .159186794226E-01
   3          .300000000000E+01
U =      .400000          P =      2.000000        I(U,P) =   .332739084163E-01
   3          .300000000000E+01
U =      .500000          P =      2.000000        I(U,P) =   .573798362723E-01
   3          .300000000000E+01
U =      .600000          P =      2.000000        I(U,P) =   .876571174908E-01
   3          .300000000000E+01
U =      .700000          P =      2.000000        I(U,P) =   .123220788784E+00
   3          .300000000000E+01
U =      .800000          P =      2.000000        I(U,P) =   .163042885807E+00
   3          .300000000000E+01
U =      .900000          P =      2.000000        I(U,P) =   .206062994147E+00
   3          .300000000000E+01
U =     1.000000          P =      2.000000        I(U,P) =   .251260465927E+00
   3          .300000000000E+01
U =     1.100000          P =      2.000000        I(U,P) =   .297698778525E+00
   3          .300000000000E+01
U =     1.200000          P =      2.000000        I(U,P) =   .344549977546E+00
   3          .300000000000E+01
U =     1.300000          P =      2.000000        I(U,P) =   .391105180196E+00
   3          .300000000000E+01
U =     1.400000          P =      2.000000        I(U,P) =   .436775596703E+00
   3          .300000000000E+01
U =     1.500000          P =      2.000000        I(U,P) =   .481087359999E+00
   3          .300000000000E+01
U =     1.600000          P =      2.000000        I(U,P) =   .523672561332E+00
   3          .300000000000E+01
U =     1.700000          P =      2.000000        I(U,P) =   .564258211228E+00
   3          .300000000000E+01
U =     1.800000          P =      2.000000        I(U,P) =   .602654333554E+00
   3          .300000000000E+01
U =     1.900000          P =      2.000000        I(U,P) =   .638742017683E+00
   3          .300000000000E+01
U =     2.000000          P =      2.000000        I(U,P) =   .672461970338E+00
   3          .300000000000E+01
U =     2.100000          P =      2.000000        I(U,P) =   .703803901366E+00
   3          .300000000000E+01
U =     2.200000          P =      2.000000        I(U,P) =   .732796928359E+00
   3          .300000000000E+01
U =     2.300000          P =      2.000000        I(U,P) =   .759501079600E+00
   3          .300000000000E+01
U =     2.400000          P =      2.000000        I(U,P) =   .783999902269E+00
   3          .300000000000E+01
U =     2.500000          P =      2.000000        I(U,P) =   .806394134801E+00
   3          .300000000000E+01
U =     2.600000          P =      2.000000        I(U,P) =   .826796372210E+00
   3          .300000000000E+01
U =     2.700000          P =      2.000000        I(U,P) =   .845326636151E+00
   3          .300000000000E+01
U =     2.800000          P =      2.000000        I(U,P) =   .862108753689E+00
   3          .300000000000E+01
U =     2.900000          P =      2.000000        I(U,P) =   .877267447376E+00
   3          .300000000000E+01
U =     3.000000          P =      2.000000        I(U,P) =   .890926042158E+00
```

```
   3          .350000000000E+01
U =       .100000          P =       2.500000          I(U,P) =    .210631087928E-03
   3          .350000000000E+01
U =       .200000          P =       2.500000          I(U,P) =    .206380282799E-02
   3          .350000000000E+01
U =       .300000          P =       2.500000          I(U,P) =    .739668242440E-02
   3          .350000000000E+01
U =       .400000          P =       2.500000          I(U,P) =    .175750353806E-01
   3          .350000000000E+01
U =       .500000          P =       2.500000          I(U,P) =    .333576129694E-01
   3          .350000000000E+01
U =       .600000          P =       2.500000          I(U,P) =    .549539458907E-01
   3          .350000000000E+01
U =       .700000          P =       2.500000          I(U,P) =    .821398303100E-01
   3          .350000000000E+01
U =       .800000          P =       2.500000          I(U,P) =    .114381038707E+00
   3          .350000000000E+01
U =       .900000          P =       2.500000          I(U,P) =    .150945111460E+00
   3          .350000000000E+01
U =      1.000000          P =       2.500000          I(U,P) =    .190993899399E+00
   3          .350000000000E+01
U =      1.100000          P =       2.500000          I(U,P) =    .233655561592E+00
   3          .350000000000E+01
U =      1.200000          P =       2.500000          I(U,P) =    .278077611147E+00
   3          .350000000000E+01
U =      1.300000          P =       2.500000          I(U,P) =    .323463213192E+00
   3          .350000000000E+01
U =      1.400000          P =       2.500000          I(U,P) =    .369094925600E+00
   3          .350000000000E+01
U =      1.500000          P =       2.500000          I(U,P) =    .414347174868E+00
   3          .350000000000E+01
U =      1.600000          P =       2.500000          I(U,P) =    .458691225432E+00
   3          .350000000000E+01
U =      1.700000          P =       2.500000          I(U,P) =    .501694339172E+00
   3          .350000000000E+01
U =      1.800000          P =       2.500000          I(U,P) =    .543014980674E+00
   3          .350000000000E+01
U =      1.900000          P =       2.500000          I(U,P) =    .582395475985E+00
   3          .350000000000E+01
U =      2.000000          P =       2.500000          I(U,P) =    .619653209499E+00
   3          .350000000000E+01
U =      2.100000          P =       2.500000          I(U,P) =    .654671170730E+00
   3          .350000000000E+01
U =      2.200000          P =       2.500000          I(U,P) =    .687388438736E+00
   3          .350000000000E+01
U =      2.300000          P =       2.500000          I(U,P) =    .717791012611E+00
   3          .350000000000E+01
U =      2.400000          P =       2.500000          I(U,P) =    .745903255988E+00
   3          .350000000000E+01
U =      2.500000          P =       2.500000          I(U,P) =    .771780115975E+00
   3          .350000000000E+01
U =      2.600000          P =       2.500000          I(U,P) =    .795500196554E+00
   3          .350000000000E+01
U =      2.700000          P =       2.500000          I(U,P) =    .817159708082E+00
   3          .350000000000E+01
U =      2.800000          P =       2.500000          I(U,P) =    .836867273540E+00
   3          .350000000000E+01
U =      2.900000          P =       2.500000          I(U,P) =    .854739544760E+00
   3          .350000000000E+01
U =      3.000000          P =       2.500000          I(U,P) =    .870897564846E+00
```

```
   4          .4000000000000E+01
U =       .100000          P =       3.000000          I(U,P) =    .568402407595E-04
   4          .4000000000000E+01
U =       .200000          P =       3.000000          I(U,P) =    .776251376209E-03
   4          .4000000000000E+01
U =       .300000          P =       3.000000          I(U,P) =    .335806885325E-02
   4          .4000000000000E+01
U =       .400000          P =       3.000000          I(U,P) =    .907985780015E-02
   4          .4000000000000E+01
U =       .500000          P =       3.000000          I(U,P) =    .189881568762E-01
   4          .4000000000000E+01
U =       .600000          P =       3.000000          I(U,P) =    .337689681857E-01
   4          .4000000000000E+01
U =       .700000          P =       3.000000          I(U,P) =    .537252503681E-01
   4          .4000000000000E+01
U =       .800000          P =       3.000000          I(U,P) =    .788134872297E-01
   4          .4000000000000E+01
U =       .900000          P =       3.000000          I(U,P) =    .108708394709E+00
   4          .4000000000000E+01
U =      1.000000          P =       3.000000          I(U,P) =    .142876539501E+00
   4          .4000000000000E+01
U =      1.100000          P =       3.000000          I(U,P) =    .180647578297E+00
   4          .4000000000000E+01
U =      1.200000          P =       3.000000          I(U,P) =    .221277088964E+00
   4          .4000000000000E+01
U =      1.300000          P =       3.000000          I(U,P) =    .263998355615E+00
   4          .4000000000000E+01
U =      1.400000          P =       3.000000          I(U,P) =    .308062567409E+00
   4          .4000000000000E+01
U =      1.500000          P =       3.000000          I(U,P) =    .352768111218E+00
   4          .4000000000000E+01
U =      1.600000          P =       3.000000          I(U,P) =    .397480275594E+00
   4          .4000000000000E+01
U =      1.700000          P =       3.000000          I(U,P) =    .441642944717E+00
   4          .4000000000000E+01
U =      1.800000          P =       3.000000          I(U,P) =    .484783889534E+00
   4          .4000000000000E+01
U =      1.900000          P =       3.000000          I(U,P) =    .526515156740E+00
   4          .4000000000000E+01
U =      2.000000          P =       3.000000          I(U,P) =    .566529879633E+00
   4          .4000000000000E+01
U =      2.100000          P =       3.000000          I(U,P) =    .604596630398E+00
   4          .4000000000000E+01
U =      2.200000          P =       3.000000          I(U,P) =    .640552227211E+00
   4          .4000000000000E+01
U =      2.300000          P =       3.000000          I(U,P) =    .674293716979E+00
   4          .4000000000000E+01
U =      2.400000          P =       3.000000          I(U,P) =    .705770083503E+00
   4          .4000000000000E+01
U =      2.500000          P =       3.000000          I(U,P) =    .734974084703E+00
   4          .4000000000000E+01
U =      2.600000          P =       3.000000          I(U,P) =    .761934501277E+00
   4          .4000000000000E+01
U =      2.700000          P =       3.000000          I(U,P) =    .786708981566E+00
   4          .4000000000000E+01
U =      2.800000          P =       3.000000          I(U,P) =    .809377590658E+00
   4          .4000000000000E+01
U =      2.900000          P =       3.000000          I(U,P) =    .830037113334E+00
   4          .4000000000000E+01
U =      3.000000          P =       3.000000          I(U,P) =    .848796117223E+00
```

```
   4          .450000000000E+01
U =       .100000          P =       3.500000        I(U,P) =    .149871972877E-04
   4          .450000000000E+01
U =       .200000          P =       3.500000        I(U,P) =    .285540751958E-03
   4          .450000000000E+01
U =       .300000          P =       3.500000        I(U,P) =    .149235389445E-02
   4          .450000000000E+01
U =       .400000          P =       3.500000        I(U,P) =    .459607067587E-02
   4          .450000000000E+01
U =       .500000          P =       3.500000        I(U,P) =    .105995474937E-01
   4          .450000000000E+01
U =       .600000          P =       3.500000        I(U,P) =    .203676699138E-01
   4          .450000000000E+01
U =       .700000          P =       3.500000        I(U,P) =    .345216302672E-01
   4          .450000000000E+01
U =       .800000          P =       3.500000        I(U,P) =    .533966254760E-01
   4          .450000000000E+01
U =       .900000          P =       3.500000        I(U,P) =    .770454230236E-01
   4          .450000000000E+01
U =      1.000000          P =       3.500000        I(U,P) =    .105271027820E+00
   4          .450000000000E+01
U =      1.100000          P =       3.500000        I(U,P) =    .137674864065E+00
   4          .450000000000E+01
U =      1.200000          P =       3.500000        I(U,P) =    .173710571114E+00
   4          .450000000000E+01
U =      1.300000          P =       3.500000        I(U,P) =    .212736197655E+00
   4          .450000000000E+01
U =      1.400000          P =       3.500000        I(U,P) =    .254061864958E+00
   4          .450000000000E+01
U =      1.500000          P =       3.500000        I(U,P) =    .296989153312E+00
   4          .450000000000E+01
U =      1.600000          P =       3.500000        I(U,P) =    .340842638548E+00
   4          .450000000000E+01
U =      1.700000          P =       3.500000        I(U,P) =    .384993256643E+00
   4          .450000000000E+01
U =      1.800000          P =       3.500000        I(U,P) =    .428874291372E+00
   4          .450000000000E+01
U =      1.900000          P =       3.500000        I(U,P) =    .471990997232E+00
   4          .450000000000E+01
U =      2.000000          P =       3.500000        I(U,P) =    .513924982460E+00
   4          .450000000000E+01
U =      2.100000          P =       3.500000        I(U,P) =    .554334467916E+00
   4          .450000000000E+01
U =      2.200000          P =       3.500000        I(U,P) =    .592951453869E+00
   4          .450000000000E+01
U =      2.300000          P =       3.500000        I(U,P) =    .629576702316E+00
   4          .450000000000E+01
U =      2.400000          P =       3.500000        I(U,P) =    .664073301112E+00
   4          .450000000000E+01
U =      2.500000          P =       3.500000        I(U,P) =    .696359433648E+00
   4          .450000000000E+01
U =      2.600000          P =       3.500000        I(U,P) =    .726400843851E+00
   4          .450000000000E+01
U =      2.700000          P =       3.500000        I(U,P) =    .754203366510E+00
   4          .450000000000E+01
U =      2.800000          P =       3.500000        I(U,P) =    .779805789752E+00
   4          .450000000000E+01
U =      2.900000          P =       3.500000        I(U,P) =    .803273230576E+00
   4          .450000000000E+01
U =      3.000000          P =       3.500000        I(U,P) =    .824691134833E+00
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```
   5          .500000000000E+01
U =      .100000          P =      4.000000        I(U,P) =    .386844019810E-05
   5          .500000000000E+01
U =      .200000          P =      4.000000        I(U,P) =    .102902325551E-03
   5          .500000000000E+01
U =      .300000          P =      4.000000        I(U,P) =    .650256682216E-03
   5          .500000000000E+01
U =      .400000          P =      4.000000        I(U,P) =    .228277528583E-02
   5          .500000000000E+01
U =      .500000          P =      4.000000        I(U,P) =    .581027876542E-02
   5          .500000000000E+01
U =      .600000          P =      4.000000        I(U,P) =    .120726954337E-01
   5          .500000000000E+01
U =      .700000          P =      4.000000        I(U,P) =    .218160022451E-01
   5          .500000000000E+01
U =      .800000          P =      4.000000        I(U,P) =    .356062979064E-01
   5          .500000000000E+01
U =      .900000          P =      4.000000        I(U,P) =    .537843137798E-01
   5          .500000000000E+01
U =     1.000000          P =      4.000000        I(U,P) =    .764545246626E-01
   5          .500000000000E+01
U =     1.100000          P =      4.000000        I(U,P) =    .103500033500E+00
   5          .500000000000E+01
U =     1.200000          P =      4.000000        I(U,P) =    .134614223283E+00
   5          .500000000000E+01
U =     1.300000          P =      4.000000        I(U,P) =    .169341354500E+00
   5          .500000000000E+01
U =     1.400000          P =      4.000000        I(U,P) =    .207119987525E+00
   5          .500000000000E+01
U =     1.500000          P =      4.000000        I(U,P) =    .247324853932E+00
   5          .500000000000E+01
U =     1.600000          P =      4.000000        I(U,P) =    .289304351590E+00
   5          .500000000000E+01
U =     1.700000          P =      4.000000        I(U,P) =    .332412099248E+00
   5          .500000000000E+01
U =     1.800000          P =      4.000000        I(U,P) =    .376031941197E+00
   5          .500000000000E+01
U =     1.900000          P =      4.000000        I(U,P) =    .419596467617E+00
   5          .500000000000E+01
U =     2.000000          P =      4.000000        I(U,P) =    .462599555919E+00
   5          .500000000000E+01
U =     2.100000          P =      4.000000        I(U,P) =    .504603692355E+00
   5          .500000000000E+01
U =     2.200000          P =      4.000000        I(U,P) =    .545242948257E+00
   5          .500000000000E+01
U =     2.300000          P =      4.000000        I(U,P) =    .584222502152E+00
   5          .500000000000E+01
U =     2.400000          P =      4.000000        I(U,P) =    .621315551034E+00
   5          .500000000000E+01
U =     2.500000          P =      4.000000        I(U,P) =    .656358367091E+00
   5          .500000000000E+01
U =     2.600000          P =      4.000000        I(U,P) =    .689244149514E+00
   5          .500000000000E+01
U =     2.700000          P =      4.000000        I(U,P) =    .719916208315E+00
   5          .500000000000E+01
U =     2.800000          P =      4.000000        I(U,P) =    .748360907630E+00
   5          .500000000000E+01
U =     2.900000          P =      4.000000        I(U,P) =    .774600695374E+00
   5          .500000000000E+01
U =     3.000000          P =      4.000000        I(U,P) =    .798687457631E+00
```

```
    5          .550000000000E+01
U =       .100000          P =       4.500000          I(U,P) =    .979052949357E-06
    5          .550000000000E+01
U =       .200000          P =       4.500000          I(U,P) =    .363856540980E-04
    5          .550000000000E+01
U =       .300000          P =       4.500000          I(U,P) =    .278188121101E-03
    5          .550000000000E+01
U =       .400000          P =       4.500000          I(U,P) =    .111396815083E-02
    5          .550000000000E+01
U =       .500000          P =       4.500000          I(U,P) =    .313134873584E-02
    5          .550000000000E+01
U =       .600000          P =       4.500000          I(U,P) =    .704016180112E-02
    5          .550000000000E+01
U =       .700000          P =       4.500000          I(U,P) =    .135726268703E-01
    5          .550000000000E+01
U =       .800000          P =       4.500000          I(U,P) =    .233901186024E-01
    5          .550000000000E+01
U =       .900000          P =       4.500000          I(U,P) =    .370120156238E-01
    5          .550000000000E+01
U =      1.000000          P =       4.500000          I(U,P) =    .547720726608E-01
    5          .550000000000E+01
U =      1.100000          P =       4.500000          I(U,P) =    .768013704951E-01
    5          .550000000000E+01
U =      1.200000          P =       4.500000          I(U,P) =    .103032846785E+00
    5          .550000000000E+01
U =      1.300000          P =       4.500000          I(U,P) =    .133222705238E+00
    5          .550000000000E+01
U =      1.400000          P =       4.500000          I(U,P) =    .166981191453E+00
    5          .550000000000E+01
U =      1.500000          P =       4.500000          I(U,P) =    .203808734319E+00
    5          .550000000000E+01
U =      1.600000          P =       4.500000          I(U,P) =    .243132846445E+00
    5          .550000000000E+01
U =      1.700000          P =       4.500000          I(U,P) =    .284342866362E+00
    5          .550000000000E+01
U =      1.800000          P =       4.500000          I(U,P) =    .326820590280E+00
    5          .550000000000E+01
U =      1.900000          P =       4.500000          I(U,P) =    .369965719890E+00
    5          .550000000000E+01
U =      2.000000          P =       4.500000          I(U,P) =    .413215739353E+00
    5          .550000000000E+01
U =      2.100000          P =       4.500000          I(U,P) =    .456060334149E+00
    5          .550000000000E+01
U =      2.200000          P =       4.500000          I(U,P) =    .498050798708E+00
    5          .550000000000E+01
U =      2.300000          P =       4.500000          I(U,P) =    .538805077975E+00
    5          .550000000000E+01
U =      2.400000          P =       4.500000          I(U,P) =    .578009180646E+00
    5          .550000000000E+01
U =      2.500000          P =       4.500000          I(U,P) =    .615415717092E+00
    5          .550000000000E+01
U =      2.600000          P =       4.500000          I(U,P) =    .650840277338E+00
    5          .550000000000E+01
U =      2.700000          P =       4.500000          I(U,P) =    .684156293751E+00
    5          .550000000000E+01
U =      2.800000          P =       4.500000          I(U,P) =    .715288944621E+00
    5          .550000000000E+01
U =      2.900000          P =       4.500000          I(U,P) =    .744208559995E+00
    5          .550000000000E+01
U =      3.000000          P =       4.500000          I(U,P) =    .770923897889E+00
```

```
   6          .600000000000E+01
U =       .100000          P =       5.000000          I(U,P) =    .243299064095E-06
   6          .600000000000E+01
U =       .200000          P =       5.000000          I(U,P) =    .126402101121E-04
   6          .600000000000E+01
U =       .300000          P =       5.000000          I(U,P) =    .116994872936E-03
   6          .600000000000E+01
U =       .400000          P =       5.000000          I(U,P) =    .534702654689E-03
   6          .600000000000E+01
U =       .500000          P =       5.000000          I(U,P) =    .166092958849E-02
   6          .600000000000E+01
U =       .600000          P =       5.000000          I(U,P) =    .404297832832E-02
   6          .600000000000E+01
U =       .700000          P =       5.000000          I(U,P) =    .832046426602E-02
   6          .600000000000E+01
U =       .800000          P =       5.000000          I(U,P) =    .151490951164E-01
   6          .600000000000E+01
U =       .900000          P =       5.000000          I(U,P) =    .251264546651E-01
   6          .600000000000E+01
U =      1.000000          P =       5.000000          I(U,P) =    .387318188487E-01
   6          .600000000000E+01
U =      1.100000          P =       5.000000          I(U,P) =    .562858174785E-01
   6          .600000000000E+01
U =      1.200000          P =       5.000000          I(U,P) =    .779309358306E-01
   6          .600000000000E+01
U =      1.300000          P =       5.000000          I(U,P) =    .103630685515E+00
   6          .600000000000E+01
U =      1.400000          P =       5.000000          I(U,P) =    .133183571672E+00
   6          .600000000000E+01
U =      1.500000          P =       5.000000          I(U,P) =    .166247391751E+00
   6          .600000000000E+01
U =      1.600000          P =       5.000000          I(U,P) =    .202369555856E+00
   6          .600000000000E+01
U =      1.700000          P =       5.000000          I(U,P) =    .241019709478E+00
   6          .600000000000E+01
U =      1.800000          P =       5.000000          I(U,P) =    .281621730698E+00
   6          .600000000000E+01
U =      1.900000          P =       5.000000          I(U,P) =    .323583003038E+00
   6          .600000000000E+01
U =      2.000000          P =       5.000000          I(U,P) =    .366319630794E+00
   6          .600000000000E+01
U =      2.100000          P =       5.000000          I(U,P) =    .409276911943E+00
   6          .600000000000E+01
U =      2.200000          P =       5.000000          I(U,P) =    .451944893718E+00
   6          .600000000000E+01
U =      2.300000          P =       5.000000          I(U,P) =    .493869208648E+00
   6          .600000000000E+01
U =      2.400000          P =       5.000000          I(U,P) =    .534657638058E+00
   6          .600000000000E+01
U =      2.500000          P =       5.000000          I(U,P) =    .573982995647E+00
   6          .600000000000E+01
U =      2.600000          P =       5.000000          I(U,P) =    .611582987813E+00
   6          .600000000000E+01
U =      2.700000          P =       5.000000          I(U,P) =    .647257710899E+00
   6          .600000000000E+01
U =      2.800000          P =       5.000000          I(U,P) =    .680865407109E+00
   6          .600000000000E+01
U =      2.900000          P =       5.000000          I(U,P) =    .712317036081E+00
   6          .600000000000E+01
U =      3.000000          P =       5.000000          I(U,P) =    .741570140259E+00
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```
   6          .650000000000E+01
U =       .100000          P =       5.500000          I(U,P) =    .594387125411E-07
   6          .650000000000E+01
U =       .200000          P =       5.500000          I(U,P) =    .431914085561E-05
   6          .650000000000E+01
U =       .300000          P =       5.500000          I(U,P) =    .484215690064E-04
   6          .650000000000E+01
U =       .400000          P =       5.500000          I(U,P) =    .252709108807E-03
   6          .650000000000E+01
U =       .500000          P =       5.500000          I(U,P) =    .867891594198E-03
   6          .650000000000E+01
U =       .600000          P =       5.500000          I(U,P) =    .228844395138E-02
   6          .650000000000E+01
U =       .700000          P =       5.500000          I(U,P) =    .503010315961E-02
   6          .650000000000E+01
U =       .800000          P =       5.500000          I(U,P) =    .968081719702E-02
   6          .650000000000E+01
U =       .900000          P =       5.500000          I(U,P) =    .168389772730E-01
   6          .650000000000E+01
U =      1.000000          P =       5.500000          I(U,P) =    .270518485724E-01
   6          .650000000000E+01
U =      1.100000          P =       5.500000          I(U,P) =    .407637429051E-01
   6          .650000000000E+01
U =      1.200000          P =       5.500000          I(U,P) =    .582788609896E-01
   6          .650000000000E+01
U =      1.300000          P =       5.500000          I(U,P) =    .797418033012E-01
   6          .650000000000E+01
U =      1.400000          P =       5.500000          I(U,P) =    .105133281349E+00
   6          .650000000000E+01
U =      1.500000          P =       5.500000          I(U,P) =    .134279649810E+00
   6          .650000000000E+01
U =      1.600000          P =       5.500000          I(U,P) =    .166872381584E+00
   6          .650000000000E+01
U =      1.700000          P =       5.500000          I(U,P) =    .202493996452E+00
   6          .650000000000E+01
U =      1.800000          P =       5.500000          I(U,P) =    .240647152284E+00
   6          .650000000000E+01
U =      1.900000          P =       5.500000          I(U,P) =    .280784142559E+00
   6          .650000000000E+01
U =      2.000000          P =       5.500000          I(U,P) =    .322334688795E+00
   6          .650000000000E+01
U =      2.100000          P =       5.500000          I(U,P) =    .364730566889E+00
   6          .650000000000E+01
U =      2.200000          P =       5.500000          I(U,P) =    .407426196488E+00
   6          .650000000000E+01
U =      2.300000          P =       5.500000          I(U,P) =    .449914816457E+00
   6          .650000000000E+01
U =      2.400000          P =       5.500000          I(U,P) =    .491740254226E+00
   6          .650000000000E+01
U =      2.500000          P =       5.500000          I(U,P) =    .532504573858E+00
   6          .650000000000E+01
U =      2.600000          P =       5.500000          I(U,P) =    .571872068340E+00
   6          .650000000000E+01
U =      2.700000          P =       5.500000          I(U,P) =    .609570161251E+00
   6          .650000000000E+01
U =      2.800000          P =       5.500000          I(U,P) =    .645387818958E+00
   6          .650000000000E+01
U =      2.900000          P =       5.500000          I(U,P) =    .679172063379E+00
   6          .650000000000E+01
U =      3.000000          P =       5.500000          I(U,P) =    .710823131816E+00
```

```
   7          .700000000000E+01
U =       .100000          P =       6.000000        I(U,P) =    .142908902490E-07
   7          .700000000000E+01
U =       .200000          P =       6.000000        I(U,P) =    .145311601045E-05
   7          .700000000000E+01
U =       .300000          P =       6.000000        I(U,P) =    .197410519730E-04
   7          .700000000000E+01
U =       .400000          P =       6.000000        I(U,P) =    .117703397746E-03
   7          .700000000000E+01
U =       .500000          P =       6.000000        I(U,P) =    .447136299676E-03
   7          .700000000000E+01
U =       .600000          P =       6.000000        I(U,P) =    .127773376040E-02
   7          .700000000000E+01
U =       .700000          P =       6.000000        I(U,P) =    .300101915953E-02
   7          .700000000000E+01
U =       .800000          P =       6.000000        I(U,P) =    .610803285805E-02
   7          .700000000000E+01
U =       .900000          P =       6.000000        I(U,P) =    .111471976893E-01
   7          .700000000000E+01
U =      1.000000          P =       6.000000        I(U,P) =    .186720848133E-01
   7          .700000000000E+01
U =      1.100000          P =       6.000000        I(U,P) =    .291887301672E-01
   7          .700000000000E+01
U =      1.200000          P =       6.000000        I(U,P) =    .431101164283E-01
   7          .700000000000E+01
U =      1.300000          P =       6.000000        I(U,P) =    .607226382537E-01
   7          .700000000000E+01
U =      1.400000          P =       6.000000        I(U,P) =    .821666246459E-01
   7          .700000000000E+01
U =      1.500000          P =       6.000000        I(U,P) =    .107430750342E+00
   7          .700000000000E+01
U =      1.600000          P =       6.000000        I(U,P) =    .136358599779E+00
   7          .700000000000E+01
U =      1.700000          P =       6.000000        I(U,P) =    .168664745054E+00
   7          .700000000000E+01
U =      1.800000          P =       6.000000        I(U,P) =    .203957358485E+00
   7          .700000000000E+01
U =      1.900000          P =       6.000000        I(U,P) =    .241764457555E+00
   7          .700000000000E+01
U =      2.000000          P =       6.000000        I(U,P) =    .281561230260E+00
   7          .700000000000E+01
U =      2.100000          P =       6.000000        I(U,P) =    .322796386640E+00
   7          .700000000000E+01
U =      2.200000          P =       6.000000        I(U,P) =    .364916029694E+00
   7          .700000000000E+01
U =      2.300000          P =       6.000000        I(U,P) =    .407384066895E+00
   7          .700000000000E+01
U =      2.400000          P =       6.000000        I(U,P) =    .449698649167E+00
   7          .700000000000E+01
U =      2.500000          P =       6.000000        I(U,P) =    .491404505111E+00
   7          .700000000000E+01
U =      2.600000          P =       6.000000        I(U,P) =    .532101327827E+00
   7          .700000000000E+01
U =      2.700000          P =       6.000000        I(U,P) =    .571448573653E+00
   7          .700000000000E+01
U =      2.800000          P =       6.000000        I(U,P) =    .609167156717E+00
   7          .700000000000E+01
U =      2.900000          P =       6.000000        I(U,P) =    .645038583806E+00
   7          .700000000000E+01
U =      3.000000          P =       6.000000        I(U,P) =    .678902084864E+00
```

```
   7          .750000000000E+01
U =       .100000          P =       6.500000          I(U,P) =    .338471493279E-08
   7          .750000000000E+01
U =       .200000          P =       6.500000          I(U,P) =    .481785734928E-06
   7          .750000000000E+01
U =       .300000          P =       6.500000          I(U,P) =    .793470753991E-05
   7          .750000000000E+01
U =       .400000          P =       6.500000          I(U,P) =    .540711301228E-04
   7          .750000000000E+01
U =       .500000          P =       6.500000          I(U,P) =    .227301595918E-03
   7          .750000000000E+01
U =       .600000          P =       6.500000          I(U,P) =    .704220872141E-03
   7          .750000000000E+01
U =       .700000          P =       6.500000          I(U,P) =    .176811243196E-02
   7          .750000000000E+01
U =       .800000          P =       6.500000          I(U,P) =    .380733532425E-02
   7          .750000000000E+01
U =       .900000          P =       6.500000          I(U,P) =    .729335873351E-02
   7          .750000000000E+01
U =      1.000000          P =       6.500000          I(U,P) =    .127433076815E-01
   7          .750000000000E+01
U =      1.100000          P =       6.500000          I(U,P) =    .206744510149E-01
   7          .750000000000E+01
U =      1.200000          P =       6.500000          I(U,P) =    .315577200064E-01
   7          .750000000000E+01
U =      1.300000          P =       6.500000          I(U,P) =    .457777184633E-01
   7          .750000000000E+01
U =      1.400000          P =       6.500000          I(U,P) =    .636018741201E-01
   7          .750000000000E+01
U =      1.500000          P =       6.500000          I(U,P) =    .851620147143E-01
   7          .750000000000E+01
U =      1.600000          P =       6.500000          I(U,P) =    .110448103854E+00
   7          .750000000000E+01
U =      1.700000          P =       6.500000          I(U,P) =    .139313016119E+00
   7          .750000000000E+01
U =      1.800000          P =       6.500000          I(U,P) =    .171486254611E+00
   7          .750000000000E+01
U =      1.900000          P =       6.500000          I(U,P) =    .206594088593E+00
   7          .750000000000E+01
U =      2.000000          P =       6.500000          I(U,P) =    .244183541203E+00
   7          .750000000000E+01
U =      2.100000          P =       6.500000          I(U,P) =    .283747878082E+00
   7          .750000000000E+01
U =      2.200000          P =       6.500000          I(U,P) =    .324751632678E+00
   7          .750000000000E+01
U =      2.300000          P =       6.500000          I(U,P) =    .366653664893E+00
   7          .750000000000E+01
U =      2.400000          P =       6.500000          I(U,P) =    .408927219666E+00
   7          .750000000000E+01
U =      2.500000          P =       6.500000          I(U,P) =    .451076385081E+00
   7          .750000000000E+01
U =      2.600000          P =       6.500000          I(U,P) =    .492648718310E+00
   7          .750000000000E+01
U =      2.700000          P =       6.500000          I(U,P) =    .533244099671E+00
   7          .750000000000E+01
U =      2.800000          P =       6.500000          I(U,P) =    .572520088707E+00
   7          .750000000000E+01
U =      2.900000          P =       6.500000          I(U,P) =    .610194197240E+00
   7          .750000000000E+01
U =      3.000000          P =       6.500000          I(U,P) =    .646043572857E+00
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```
   8          .8000000000000E+01
U =       .100000          P =       7.000000        I(U,P) =    .790365332665E-09
   8          .8000000000000E+01
U =       .200000          P =       7.000000        I(U,P) =    .157546033041E-06
   8          .8000000000000E+01
U =       .300000          P =       7.000000        I(U,P) =    .314667657164E-05
   8          .8000000000000E+01
U =       .400000          P =       7.000000        I(U,P) =    .245168027577E-04
   8          .8000000000000E+01
U =       .500000          P =       7.000000        I(U,P) =    .114090387496E-03
   8          .8000000000000E+01
U =       .600000          P =       7.000000        I(U,P) =    .383375315436E-03
   8          .8000000000000E+01
U =       .700000          P =       7.000000        I(U,P) =    .102934515699E-02
   8          .8000000000000E+01
U =       .800000          P =       7.000000        I(U,P) =    .234592846191E-02
   8          .8000000000000E+01
U =       .900000          P =       7.000000        I(U,P) =    .471875691890E-02
   8          .8000000000000E+01
U =      1.000000          P =       7.000000        I(U,P) =    .860348352718E-02
   8          .8000000000000E+01
U =      1.100000          P =       7.000000        I(U,P) =    .144916267066E-01
   8          .8000000000000E+01
U =      1.200000          P =       7.000000        I(U,P) =    .228698123597E-01
   8          .8000000000000E+01
U =      1.300000          P =       7.000000        I(U,P) =    .341785736742E-01
   8          .8000000000000E+01
U =      1.400000          P =       7.000000        I(U,P) =    .487759757958E-01
   8          .8000000000000E+01
U =      1.500000          P =       7.000000        I(U,P) =    .669097897290E-01
   8          .8000000000000E+01
U =      1.600000          P =       7.000000        I(U,P) =    .887002082724E-01
   8          .8000000000000E+01
U =      1.700000          P =       7.000000        I(U,P) =    .114133505735E+00
   8          .8000000000000E+01
U =      1.800000          P =       7.000000        I(U,P) =    .143065783032E+00
   8          .8000000000000E+01
U =      1.900000          P =       7.000000        I(U,P) =    .175235084615E+00
   8          .8000000000000E+01
U =      2.000000          P =       7.000000        I(U,P) =    .210279714613E+00
   8          .8000000000000E+01
U =      2.100000          P =       7.000000        I(U,P) =    .247760457313E+00
   8          .8000000000000E+01
U =      2.200000          P =       7.000000        I(U,P) =    .287184539303E+00
   8          .8000000000000E+01
U =      2.300000          P =       7.000000        I(U,P) =    .328029471018E+00
   8          .8000000000000E+01
U =      2.400000          P =       7.000000        I(U,P) =    .369765296527E+00
   8          .8000000000000E+01
U =      2.500000          P =       7.000000        I(U,P) =    .411874199154E+00
   8          .8000000000000E+01
U =      2.600000          P =       7.000000        I(U,P) =    .453866811178E+00
   8          .8000000000000E+01
U =      2.700000          P =       7.000000        I(U,P) =    .495294928284E+00
   8          .8000000000000E+01
U =      2.800000          P =       7.000000        I(U,P) =    .535760617712E+00
   8          .8000000000000E+01
U =      2.900000          P =       7.000000        I(U,P) =    .574921927511E+00
   8          .8000000000000E+01
U =      3.000000          P =       7.000000        I(U,P) =    .612495555479E+00
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```
   8          .8500000000000E+01
U =       .100000          P =       7.500000          I(U,P) =    .182095837449E-09
   8          .8500000000000E+01
U =       .200000          P =       7.500000          I(U,P) =    .508480136276E-07
   8          .8500000000000E+01
U =       .300000          P =       7.500000          I(U,P) =    .123205984309E-05
   8          .8500000000000E+01
U =       .400000          P =       7.500000          I(U,P) =    .109791059282E-04
   8          .8500000000000E+01
U =       .500000          P =       7.500000          I(U,P) =    .565779660635E-04
   8          .8500000000000E+01
U =       .600000          P =       7.500000          I(U,P) =    .206271268076E-03
   8          .8500000000000E+01
U =       .700000          P =       7.500000          I(U,P) =    .592461039310E-03
   8          .8500000000000E+01
U =       .800000          P =       7.500000          I(U,P) =    .142956832437E-02
   8          .8500000000000E+01
U =       .900000          P =       7.500000          I(U,P) =    .302046357801E-02
   8          .8500000000000E+01
U =      1.000000          P =       7.500000          I(U,P) =    .574860417956E-02
   8          .8500000000000E+01
U =      1.100000          P =       7.500000          I(U,P) =    .100566114550E-01
   8          .8500000000000E+01
U =      1.200000          P =       7.500000          I(U,P) =    .164142012203E-01
   8          .8500000000000E+01
U =      1.300000          P =       7.500000          I(U,P) =    .252815524307E-01
   8          .8500000000000E+01
U =      1.400000          P =       7.500000          I(U,P) =    .370716926947E-01
   8          .8500000000000E+01
U =      1.500000          P =       7.500000          I(U,P) =    .521175984915E-01
   8          .8500000000000E+01
U =      1.600000          P =       7.500000          I(U,P) =    .706468114080E-01
   8          .8500000000000E+01
U =      1.700000          P =       7.500000          I(U,P) =    .927654945747E-01
   8          .8500000000000E+01
U =      1.800000          P =       7.500000          I(U,P) =    .118452407963E+00
   8          .8500000000000E+01
U =      1.900000          P =       7.500000          I(U,P) =    .147562157439E+00
   8          .8500000000000E+01
U =      2.000000          P =       7.500000          I(U,P) =    .179836273563E+00
   8          .8500000000000E+01
U =      2.100000          P =       7.500000          I(U,P) =    .214920213144E+00
   8          .8500000000000E+01
U =      2.200000          P =       7.500000          I(U,P) =    .252384212764E+00
   8          .8500000000000E+01
U =      2.300000          P =       7.500000          I(U,P) =    .291745996539E+00
   8          .8500000000000E+01
U =      2.400000          P =       7.500000          I(U,P) =    .332493578848E+00
   8          .8500000000000E+01
U =      2.500000          P =       7.500000          I(U,P) =    .374106738806E+00
   8          .8500000000000E+01
U =      2.600000          P =       7.500000          I(U,P) =    .416076118792E+00
   8          .8500000000000E+01
U =      2.700000          P =       7.500000          I(U,P) =    .457919269985E+00
   8          .8500000000000E+01
U =      2.800000          P =       7.500000          I(U,P) =    .499193302756E+00
   8          .8500000000000E+01
U =      2.900000          P =       7.500000          I(U,P) =    .539504080634E+00
   8          .8500000000000E+01
U =      3.000000          P =       7.500000          I(U,P) =    .578512115414E+00
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```
 9          .900000000000E+01
U =      .100000          P =      8.000000        I(U,P) =    .414267618446E-10
 9          .900000000000E+01
U =      .200000          P =      8.000000        I(U,P) =    .162082581064E-07
 9          .900000000000E+01
U =      .300000          P =      8.000000        I(U,P) =    .476584330225E-06
 9          .900000000000E+01
U =      .400000          P =      8.000000        I(U,P) =    .485882870664E-05
 9          .900000000000E+01
U =      .500000          P =      8.000000        I(U,P) =    .277358192501E-04
 9          .900000000000E+01
U =      .600000          P =      8.000000        I(U,P) =    .109744644936E-03
 9          .900000000000E+01
U =      .700000          P =      8.000000        I(U,P) =    .337305843637E-03
 9          .900000000000E+01
U =      .800000          P =      8.000000        I(U,P) =    .861978256338E-03
 9          .900000000000E+01
U =      .900000          P =      8.000000        I(U,P) =    .191362749731E-02
 9          .900000000000E+01
U =     1.000000          P =      8.000000        I(U,P) =    .380299206168E-02
 9          .900000000000E+01
U =     1.100000          P =      8.000000        I(U,P) =    .691181223987E-02
 9          .900000000000E+01
U =     1.200000          P =      8.000000        I(U,P) =    .116714122388E-01
 9          .900000000000E+01
U =     1.300000          P =      8.000000        I(U,P) =    .185327565006E-01
 9          .900000000000E+01
U =     1.400000          P =      8.000000        I(U,P) =    .279321909581E-01
 9          .900000000000E+01
U =     1.500000          P =      8.000000        I(U,P) =    .402573124822E-01
 9          .900000000000E+01
U =     1.600000          P =      8.000000        I(U,P) =    .558168774858E-01
 9          .900000000000E+01
U =     1.700000          P =      8.000000        I(U,P) =    .748176447461E-01
 9          .900000000000E+01
U =     1.800000          P =      8.000000        I(U,P) =    .973498298869E-01
 9          .900000000000E+01
U =     1.900000          P =      8.000000        I(U,P) =    .123381659325E+00
 9          .900000000000E+01
U =     2.000000          P =      8.000000        I(U,P) =    .152762506016E+00
 9          .900000000000E+01
U =     2.100000          P =      8.000000        I(U,P) =    .185233350710E+00
 9          .900000000000E+01
U =     2.200000          P =      8.000000        I(U,P) =    .220442862409E+00
 9          .900000000000E+01
U =     2.300000          P =      8.000000        I(U,P) =    .257967208184E+00
 9          .900000000000E+01
U =     2.400000          P =      8.000000        I(U,P) =    .297331737576E+00
 9          .900000000000E+01
U =     2.500000          P =      8.000000        I(U,P) =    .338032880859E+00
 9          .900000000000E+01
U =     2.600000          P =      8.000000        I(U,P) =    .379558893902E+00
 9          .900000000000E+01
U =     2.700000          P =      8.000000        I(U,P) =    .421408422283E+00
 9          .900000000000E+01
U =     2.800000          P =      8.000000        I(U,P) =    .463106201245E+00
 9          .900000000000E+01
U =     2.900000          P =      8.000000        I(U,P) =    .504215525652E+00
 9          .900000000000E+01
U =     3.000000          P =      8.000000        I(U,P) =    .544347395678E+00
```

```
   9          .950000000000E+01
U =       .100000          P =       8.500000          I(U,P) =    .930990997548E-11
   9          .950000000000E+01
U =       .200000          P =       8.500000          I(U,P) =    .510564441166E-08
   9          .950000000000E+01
U =       .300000          P =       8.500000          I(U,P) =    .182230370527E-06
   9          .950000000000E+01
U =       .400000          P =       8.500000          I(U,P) =    .212613666528E-05
   9          .950000000000E+01
U =       .500000          P =       8.500000          I(U,P) =    .134478314618E-04
   9          .950000000000E+01
U =       .600000          P =       8.500000          I(U,P) =    .577655392964E-04
   9          .950000000000E+01
U =       .700000          P =       8.500000          I(U,P) =    .190043409319E-03
   9          .950000000000E+01
U =       .800000          P =       8.500000          I(U,P) =    .514490348248E-03
   9          .950000000000E+01
U =       .900000          P =       8.500000          I(U,P) =    .120048302901E-02
   9          .950000000000E+01
U =      1.000000          P =       8.500000          I(U,P) =    .249189172884E-02
   9          .950000000000E+01
U =      1.100000          P =       8.500000          I(U,P) =    .470663152170E-02
   9          .950000000000E+01
U =      1.200000          P =       8.500000          I(U,P) =    .822484344730E-02
   9          .950000000000E+01
U =      1.300000          P =       8.500000          I(U,P) =    .134679664669E-01
   9          .950000000000E+01
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TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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EPA-600/2-77-179d		

4. TITLE AND SUBTITLE	5. REPORT DATE
PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW, VOLUME IV, Data Analysis Utility Programs	August 1977 issuing date
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7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
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12. SPONSORING AGENCY NAME AND ADDRESS Robert S. Kerr Environmental Research Lab. - Ada, OK Office of Research and Development U.S. Environmental Protection Agency Ada, Oklahoma 74820	13. TYPE OF REPORT AND PERIOD COVERED Final
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15. SUPPLEMENTARY NOTES

VOLUMES I, II, III, V (EPA-600/2-77-179a thru 179c, 179e)

16. ABSTRACT

The development and evaluation of modeling capability to simulate and predict the effects of irrigation on the quality of return flows are documented in the five volumes of this report. The report contains two different modeling packages which represent different levels of detail and sophistication. Volumes I, II and IV pertain to the model package given in Volume III. Volume V contains the more sophisticated model. User's manuals are included in Volumes III and V.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Mathematical Model, digital simulation, scheduling, Irrigated land, Evapotranspiration, Agriculture, Agronomy, water pollution, water loss	Irrigation Return Flow	02 C/D

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