

BETA**PURPOSE**

Compute the complete beta function.

DESCRIPTION

The beta function is defined as:

$$B(\alpha, \beta) = \int_0^1 t^{\alpha-1} (1-t)^{\beta-1} dt \quad (\text{EQ 6-79})$$

where α and β are positive real numbers. The beta function can also be defined in terms of the gamma function:

$$B(\alpha, \beta) = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)} \quad (\text{EQ 6-80})$$

SYNTAX

LET <y2> = BETA(<a>,) <SUBSET/EXCEPT/FOR qualification>

where <a> is a positive number, variable, or parameter;

 is a positive number, variable, or parameter;

<y2> is a variable or a parameter (depending on what <a> and are) where the computed Beta values are stored; and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = BETA(1,2)

LET A = BETA(A1,B3)

LET X2 = BETA(X,2)

LET X2 = BETA(X1-4,0.2)

NOTE 1

DATAPLOT uses the routine DBETA from the SLATEC Common Mathematical Library to compute this function. SLATEC is a large set of high quality, portable, public domain Fortran routines for various mathematical capabilities maintained by seven federal laboratories.

NOTE 2

If the sum of α and β is within the limits of the gamma function, the beta function is computed from the appropriate gamma functions. If the sum is not within the limits of the gamma function, the log beta function is computed. If the log beta value is larger than the log of the smallest double precision on the given machine, the exponential of this value is returned. Otherwise, an overflow error message is printed. If an overflow occurs, you can use the LNBETA function to compute the log beta function. The specific values of α and β that result in an overflow varies depending on the host.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BETAI	=	Compute the incomplete Beta function.
LNBETA	=	Compute the log Beta function.
GAMMA	=	Compute the gamma function.
LOGGAMMA	=	Compute the log gamma function.

REFERENCE

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegun, National Bureau of Standards, 1964 (chapter 6).

“Numerical Recipes: The Art of Scientific Computing (FORTRAN Version),” 2nd Edition, Press, Flannery, Teukolsky, and Vetterling, Cambridge University Press, 1992 (chapter 6).

APPLICATIONS

Special functions

IMPLEMENTATION DATE

94/9

PROGRAM

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TITLE VARIOUS BETA FUNCTIONS
XLIMITS 0 4
YLIMITS 0 12
YTIC OFFSET 0 1
LINE DOTTED SOLID DASH DASH DASH
PLOT BETA(X,0.5) FOR X = 0.01 0.01 4 AND
PLOT BETA(X,1) FOR X = 0.01 0.01 4 AND
PLOT BETA(X,2) FOR X = 0.01 0.01 4 AND
PLOT BETA(X,4) FOR X = 0.01 0.01 4 AND
PLOT BETA(X,10) FOR X = 0.01 0.01 4
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