BESSIN

PURPOSE

Compute the modified Bessel function of order v where v is a non-negative real number.

DESCRIPTION

The modified Bessel function of the first kind with order v (v is a non-negative real number) can be defined as:

$$I_v(x) = \left(\frac{x}{2}\right)^v \sum_{k=0}^{\infty} \frac{\left(\frac{x^2}{4}\right)^k}{k!\Gamma(v+k+1)} \qquad \textbf{(EQ Aux-31)}$$

where Γ is the Gamma function and ! is the factorial function.

SYNTAX

LET <y2> = BESSIN(<y1>,<v>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a non-negative number, variable or parameter;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed Bessel value is stored;

<v> is a non-negative number, variable, or parameter that specifies the order of the Bessel function;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET X2 = BESSIN(2,2)

LET A = BESSIN(X,2.5)

NOTE 1

DATAPLOT uses the routine BESI 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

Although DATAPLOT does not allow negative orders, negative orders can be calculated with the following relation:

$$I_{-v}(x) = I_v(x) + \frac{2}{\pi}\sin(v\pi)\, K_v(x) \qquad \textbf{(EQ Aux-32)}$$

where K_v is the modified Bessel function of the third kind. See the documentation for the BESSKN function for a description of this function.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BESSI0	=	Compute the modified Bessel function of order 0.
BESSI1	=	Compute the modified Bessel function of order 1.
BESSINE	=	Compute the exponentially scaled modified Bessel function of order N.
BESSJN	=	Compute the Bessel function of the first kind and order N.
BESSIN	=	Compute the modified Bessel function of order N.
BESSKN	=	Compute the modified Bessel function of the third kind and order N.

REFERENCE

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegun, National Bureau of Standards, 1964 (pages 355-433).

"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 MODIFIED BESSEL FUNCTIONS
LINE SOLID DASH DOT DA2
PLOT BESSIN(X,2) FOR X = 0 0.01 5 AND
PLOT BESSIN(X,2.5) FOR X = 0 0.01 5 AND
PLOT BESSIN(X,3) FOR X = 0 0.01 5 AND
PLOT BESSIN(X,4) FOR X = 0 0.01 5
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