BESSYN

PURPOSE

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

DESCRIPTION

The definition of Bessel functions of the second kind with order v (v is a non-negative real number) is:

$$Y_v(x) = \frac{J_v(x)\cos(\pi v) - J_{-v}(x)}{\sin(\pi v)} \qquad \textbf{(EQ Aux-44)}$$

where J_v is the Bessel function of the first kind. See the documentation for the BESSJN commands for details on this function.

SYNTAX

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

where <y1> is a positive decimal 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 = BESSYN(2,2)
LET A = BESSYN(2,2.5)
LET Y = BESSYN(X,3)

NOTE 1

DATAPLOT uses the routine BESY 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

Spherical Bessel functions can be defined for integer n by:

$$SBY_n(x) = \sqrt{\frac{\pi}{2x}}\, Y_{N+0.5}(x) \qquad \textbf{(EQ Aux-45)}$$

The second program example shows how to plot a spherical Bessel function.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BESSY0	=	Compute the Bessel function of the second kind and order 0.
BESSY1	=	Compute the Bessel function of the second kind and order 1.
BESSYN	=	Compute the Bessel function of the second 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

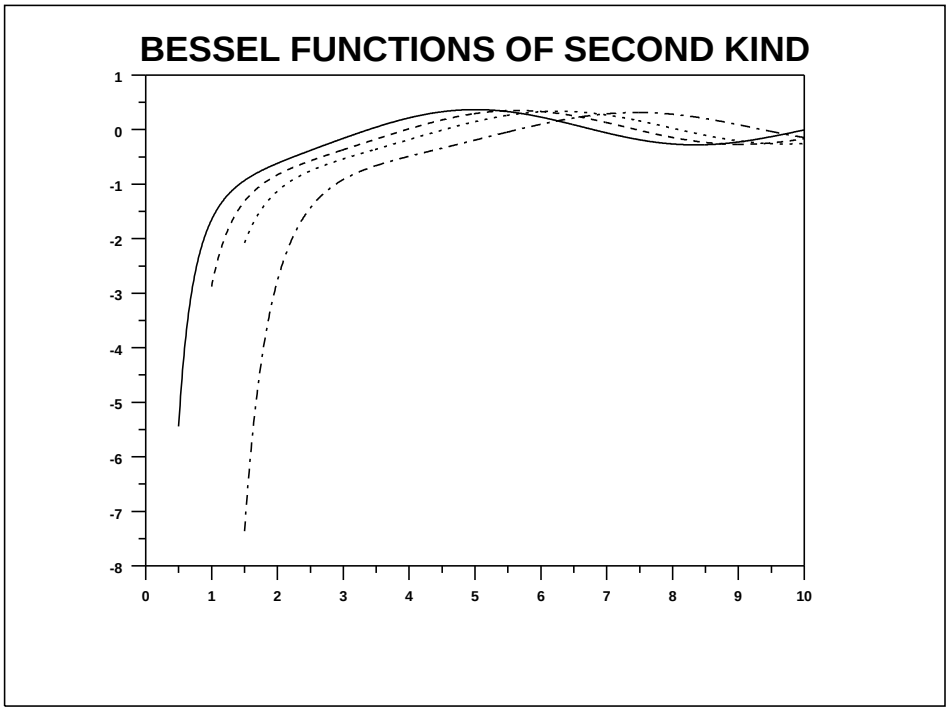
Special Functions

IMPLEMENTATION DATE

94/9

PROGRAM 1

```
TITLE BESSEL FUNCTIONS OF SECOND KIND
LINE SOLID DASH DOT DASH2
PLOT BESSYN(X,2) FOR X = 0.5 0.01 10 AND
PLOT BESSYN(X,2.5) FOR X = 1 0.01 10 AND
PLOT BESSYN(X,3) FOR X = 1.5 0.01 10 AND
PLOT BESSYN(X,4) FOR X = 1.5 0.01 10
```



PROGRAM 2

```
TITLE SPHERICAL BESSEL FUNCTIONS (N = 2, 3, 4)
LINE SOLID DASH DOT
LET FACT = SQRT(PI/2)
YLIMITS -20 0
YTIC OFFSET -5 1
PLOT (FACT/SQRT(X))*BESSYN(X,2.5) FOR X = 0.5 0.01 10 AND
PLOT (FACT/SQRT(X))*BESSYN(X,3.5) FOR X = 1.5 0.01 10 AND
PLOT (FACT/SQRT(X))*BESSYN(X,4.5) FOR X = 1.5 0.01 10
```