

BESSJN**PURPOSE**

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

DESCRIPTION

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

$$J_\nu(x) = \left(\frac{x}{2}\right)^\nu \sum_{k=0}^{\infty} \frac{\left(\frac{-x^2}{4}\right)^k}{k! \Gamma(\nu + k + 1)} \quad (\text{EQ Aux-34})$$

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

SYNTAX

LET <y2> = BESSJN(<y1>,<v>) <SUBSET/EXCEPT/FOR qualification>
 where <y1> is a 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 = BESSJN(2,2)
LET A = BESSJN(X1,3)
```

NOTE 1

DATAPLOT uses the routine BESJ 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:

$$j_n(x) = \sqrt{\frac{\pi}{2x}} \text{BESSJN}(x, n) \quad (\text{EQ Aux-35})$$

where BESSJN is the Bessel function of the first kind and order N . The second program example shows an example of plotting spherical Bessel functions.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BESS0	=	Compute the Bessel function of the first kind and order 0.
BESS1	=	Compute the Bessel function of the first 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 FIRST KIND

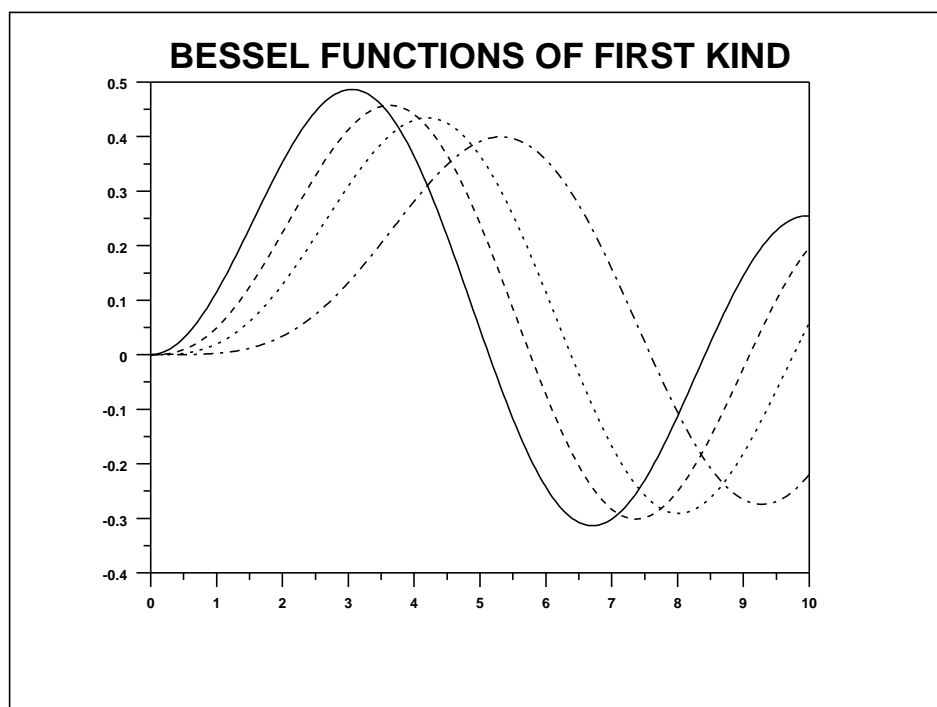
LINE SOLID DASH DOT DASH2

PLOT BESSJN(X,2) FOR X = 0 .05 10 AND

PLOT BESSJN(X,2.5) FOR X = 0 .05 10 AND

PLOT BESSJN(X,3) FOR X = 0 .05 10 AND

PLOT BESSJN(X,4) FOR X = 0 .05 10



PROGRAM 2

```
TITLE SPHERICAL BESSEL FUNCTIONS (N = 2, 3, 4)
LINE SOLID DASH DOT
LET FACT = SQRT(PI/2)
PLOT (FACT/SQRT(X))*BESSJN(X,2.5) FOR X = 0.01 .05 10 AND
PLOT (FACT/SQRT(X))*BESSJN(X,3.5) FOR X = 0.01 .05 10 AND
PLOT (FACT/SQRT(X))*BESSJN(X,4.5) FOR X = 0.01 .05 10
```

