

**BESSx****PURPOSE**

Compute the Bessel function of the first kind and order 0 or order 1. These are also referred to as the J0 and J1 Bessel functions respectively.

**DESCRIPTION**

The Bessel function  $J_v(z)$ , for  $v$  positive, can be defined by the series representation:

$$J_v(z) = \left(\frac{z}{2}\right)^v \sum_{k=0}^{\infty} \frac{\left(\frac{-z^2}{4}\right)^k}{k! \Gamma(v+k+1)} \quad (\text{EQ 6-78})$$

The first kind refers to the function J (the second kind is referred to as Y in the literature). The  $v$  is called the order of the Bessel function. Specifically, the order 0 means that  $v$  is zero while the order 1 means that  $v$  is one.

In general,  $z$  can be a complex number. However, the DATAPLOT BESSx function is limited to real values for the argument.

**SYNTAX 1**

LET <y2> = BESS0(<y1>) <SUBSET/EXCEPT/FOR qualification>  
 where <y1> is a real number, parameter, or variable;  
 <y2> is a variable or a parameter (depending on what <y1> is) where the computed Bessel value is stored;  
 and where the <SUBSET/EXCEPT/FOR qualification> is optional.

**SYNTAX 2**

LET <y2> = BESS1(<y1>) <SUBSET/EXCEPT/FOR qualification>  
 where <y1> is a real number, parameter, or variable;  
 <y2> is a variable or a parameter (depending on what <y1> is) where the computed Bessel value is stored;  
 and where the <SUBSET/EXCEPT/FOR qualification> is optional.

**EXAMPLES**

```
LET A = BESS0(-2)
LET A = BESS0(A1)
LET A = BESS1(-2)
LET A = BESS1(A1)
```

**NOTE**

DATAPLOT uses the routines BESJ0 and BESJ1 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. Versions of DATAPLOT prior to 94/7 used a different (non-SLATEC) algorithm that was limited to values of the argument greater than or equal to -3.

**DEFAULT**

None

**SYNONYMS**

BESSJ0 is a synonym for BESS0 and BESSJ1 is a synonym for BESS1.

**RELATED COMMANDS**

CHEBx = Compute the Chebychev polynomial of the first kind for various orders.

**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)," Press, Flannery, Teukolsky, and Vetterling, Cambridge University Press, 1989 (pages 170-172).

## APPLICATIONS

Special functions

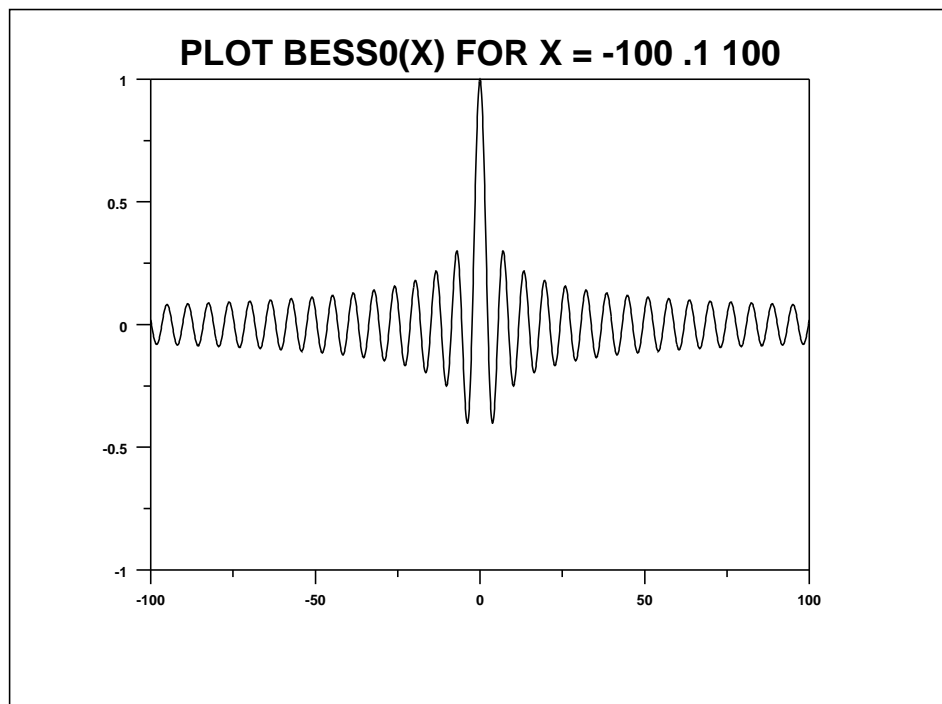
## IMPLEMENTATION DATE

Pre-1987 (algorithm was modified 94/7 to use the SLATEC BESJ0 routine)

## PROGRAM 1

TITLE AUTOMATIC

PLOT BESS0(X) FOR X = -100 .1 100



## PROGRAM 2

TITLE AUTOMATIC

PLOT BESS1(X) FOR X = -100 .1 100

