

BAIRY**PURPOSE**

Compute the Airy function of the second kind.

DESCRIPTION

The Airy function of the second kind is defined as ($z = (2/3)x^{3/2}$):

$$\text{Bi}(x) = \sqrt{\frac{x}{3}} \left(I_{1/3}(z) + I_{-1/3}(z) \right) \quad x \geq 0 \quad \text{(EQ Aux-20)}$$

$$\text{Bi}(x) = \frac{-\sqrt{-x}}{2} \left(\frac{1}{\sqrt{3}} J_{1/3}(z) + Y_{1/3}(z) \right) \quad x < 0 \quad \text{(EQ Aux-21)}$$

where I_N is the modified Bessel function of the first kind of order N , Y_N is the Bessel function of the second kind of order N , and J_N is the Bessel function of the first kind of order N . See the documentation for BESSIN, BESSJN, and BESSYN for a description of the Bessel functions.

SYNTAX

LET <y2> = BAIRY(<y1>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a decimal number, variable or a parameter;

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

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

EXAMPLES

PLOT BAIRY(X) FOR X = -10 0.1 10

LET A = BAIRY(A1)

LET X2 = BAIRY(0.2)

NOTE 1

DATAPLOT uses the function BI 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

The derivative of the Airy function of the second kind is:

$$\text{Bi}'(x) = x \left(\frac{2}{\sqrt{3}} I_{2/3}(z) + \frac{1}{\pi} I_{-1/3}(z) \right) \quad x \geq 0 \quad \text{(EQ Aux-22)}$$

$$\text{Bi}'(x) = \frac{-x}{2} \left(\frac{1}{\sqrt{3}} J_{2/3}(-z) - Y_{2/3}(-z) \right) \quad x < 0 \quad \text{(EQ Aux-23)}$$

where J and Y are the Bessel functions of the first and second kind respectively and z is $(2/3)*(-x)**(3/2)$.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

AIRY	=	Compute the Airy function.
BESSJN	=	Compute the Bessel function of the first kind (fractional orders allowed).
BESSYN	=	Compute the Bessel function of the second kind (fractional orders allowed).
BESSIN	=	Compute the modified Bessel function (fractional orders allowed).
BESSKN	=	Compute the modified Bessel function of the third kind (fractional orders allowed).

REFERENCE

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegun, National Bureau of Standards, 1964 (chapter 10).

"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

TITLE AUTOMATIC

PLOT BAIRY(X) FOR X = -3 0.01 3

