# AIRY

## PURPOSE

Compute the Airy function.

## DESCRIPTION

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

$$Ai(x) = \frac{1}{\pi}\sqrt{\frac{x}{3}}\, K_{1/3}(z) \qquad x >= 0 \qquad \textbf{(EQ Aux-1)}$$

$$Ai(x) = \frac{\sqrt{-x}}{3}\left(J_{1/3}(-z) + \frac{1}{\sqrt{3}}Y_{1/3}(-z)\right) \qquad x < 0 \qquad \textbf{(EQ Aux-2)}$$

where $K_N$ is the modified Bessel function of the third 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 BESSKN, BESSJN, and BESSYN for a desciption of the Bessel functions.

## SYNTAX

LET <y2> = AIRY(<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 AIRY(X) FOR X = -10 0.1 10

LET A = AIRY(A1)

LET X2 = AIRY(0.2)

## NOTE 1

DATAPLOT uses the routine AI 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 is ($z = (2/3)x^{3/2}$):

$$Ai'(x) = \frac{-x}{\pi\sqrt{3}}\, K_{2/3}(z) \qquad x >= 0 \qquad \textbf{(EQ Aux-3)}$$

$$Ai'(x) = \frac{-x}{2}\left(J_{2/3}(-z) - \frac{1}{\sqrt{3}}Y_{2/3}(-z)\right) \qquad x < 0 \qquad \textbf{(EQ Aux-4)}$$

## DEFAULT

None

## SYNONYMS

None

## RELATED COMMANDS

| | | |
|---|---|---|
| BAIRY | = | Compute the Airy function of the second kind. |
| BESSKN | = | Compute the modified Bessel function of the third kind (fractional orders allowed). |
| BESSKNE | = | Compute the exponentially scaled 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 AIRY(X) FOR X = -5 .1 5