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Language : Fortran

Library: MATHLIB
Submitted: 07.12.1970
Revised: 01.12.1994

Sine and Cosine Integrals

Function subprograms RSININ, RCOSIN and DSININ, DCOSIN calculate the sine and cosine integrals

$$\begin{aligned} \mathrm{Si}(x) &= \int_0^x \frac{\sin t}{t} dt \\ \mathrm{Ci}(x) &= \gamma + \ln|x| + \int_0^x \frac{\cos t - 1}{t} dt \qquad (x \neq 0) \end{aligned}$$

for real arguments x, where $\gamma = 0.57721\ldots$ is Euler's constant.

On CDC and Cray computers, the double-precision versions DSININ and DCOSIN are not available.

Structure:

FUNCTION subprograms
User Entry Names: RSININ, RCOSIN, DSININ, DCOSIN
Obsolete User Entry Names: SININT ≡ RSININ, COSINT ≡ RCOSIN
Files Referenced: Unit 6
External References: MTLMTR (N002), ABEND (Z035)

Usage:

In any arithmetic expression,

RSININ(X)	or	DSININ(X)	has the value	Si(X),
RCOSIN(X)	or	DCOSIN(X)	has the value	Ci(X),

where RSININ and RCOSIN are of type REAL, DSININ and DCOSIN are of type DOUBLE PRECISION, and X has the same type as the function name.

Method:

Approximation by truncated Chebyshev series.

Accuracy:

RSININ and RCOSIN (except on CDC and Cray computers) have full single-precision accuracy. For most values of the argument X, DSININ, DCOSIN (and RSININ, RCOSIN on CDC and Cray computers) have an accuracy of approximately one significant digit less than the machine precision.

Error handling:

Error C336.1: X = 0 for RCOSIN or DCOSIN. The function value is set equal to zero, and a message is written on Unit 6, unless subroutine MTLSET (N002) has been called.

References:

1. Y.L. Luke, The special functions and their approximations, v.II, (Academic Press, New York 1969) 325–326

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