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Submitter :
Language : Fortran

Library: MATHLIB
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Exponential Integral

Function subprograms `REXPIN` and `DEXPIN` calculate the exponential integral

$$E_1(x) \;=\; -\mathrm{Ei}(-x) \;=\; \int_x^\infty \frac{e^{-t}}{t} dt$$

for real arguments x. For $x < 0$, the real part of the principal value of the integral is taken.
On CDC and Cray computers, the double-precision versions `DEXPIN` and `DEXPIE` are not available.

Structure:

`FUNCTION` subprograms
User Entry Names: `REXPIN`, `REXPIE`, `DEXPIN`, `DEXPIE`
Obsolete User Entry Names: `EXPINT` ≡ `REXPIN`
Files Referenced: `Unit 6`
External References: `MTLMTR` (N002), `ABEND` (Z035)

Usage:

In any arithmetic expression,

`REXPIN(X)`	or	`DEXPIN(X)`	has the value	$E_1(\mathtt{X})$,
`REXPIE(X)`	or	`DEXPIE(X)`	has the value	$e^{\mathtt{X}}\, E_1(\mathtt{X})$,

where `REXPIN` and `REXPIE` are of type `REAL`, `DEXPIN` and `DEXPIE` are of type `DOUBLE PRECISION`, and `X` has the same type as the function name.

Method:

Polynomial and rational approximations.

Accuracy:

`REXPIN` and `REXPIE` (except on CDC and Cray computers) have full single-precision accuracy. For most values of the argument `X`, `DEXPIN`, `DEXPIE` (and `REXPIN`, `REXPIE` on CDC and Cray computers) have an accuracy of approximately one significant digit less than the machine precision.

Error handling:

Error `C337.1`: `X` = `0`. 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. W.J. Cody and H.C. Thatcher,Jr., Rational Chebyshev approximations for the exponential integral $E_1(x)$, Math. Comp. **22** (1968) 641–649.
2. W.J. Cody and H.C. Thatcher,Jr., Chebyshev approximations for the exponential integral Ei(x), Math. Comp. **23** (1969) 289–303.

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