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Submitter :
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Library: MATHLIB
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Fermi-Dirac Function

Function subprograms RFERDR and DFERDR calculate the Fermi-Dirac function

$$F_k(x) = \int_0^\infty \frac{t^{k/2}}{1+e^{t-x}}\,dt$$

for real argument x, and $k = -1, 1, 3$.

On CDC and Cray computers, the double-precision version DFERDR is not available.

Structure:

FUNCTION subprograms
User Entry Names: RFERDR, DFERDR
Obsolete User Entry Names: FERDR ≡ RFERDR
External References: MTLMTR (N002), ABEND (Z035)

Usage:

In any arithmetic expression,

RFERDR(X,K) or DFERDR(X,K) has the value $F_{\mathtt{K}}(\mathtt{X})$,

where RFERDR is of type REAL, DFERDR is of type DOUBLE PRECISION, and X has the same type as the function name. K (INTEGER) = -1, or 1 or 3.

Method:

Rational approximation.

Accuracy:

RFERDR (except on CDC and Cray computers) has full single-precision accuracy. For most values of the argument X, DFERDR (and RFERDR on CDC and Cray computers) has, for X > 0, an accuracy of 7-10 digits and for X < 0, an accuracy of 10 to 14 digits.

Error handling:

Error C323.1: K $\neq -1, 1, 3$. 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. Thacher,Jr., Rational approximations for Fermi-Dirac integrals of order $-1/2$, $1/2$ and $3/2$, Math. Comp. **21** (1967) 30–40.

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