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Library: MATHLIB

Submitter :

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Cauchy Principal Value Integration

Function subprograms RCAUCH and DCAUCH compute the Cauchy principal value integral

$$I = P\int_A^B f(x)dx$$

where f has a singularity inside or outside the interval $[A, B]$ such that the Cauchy principal value exists. On computers other than CDC or Cray, only the double-precision version DCAUCH is available. On CDC and Cray computers, only the single-precision version RCAUCH is available.

Structure:

FUNCTION subprograms
User Entry Names: RCAUCH, DCAUCH
Obsolete User Entry Names: CAUCHY ≡ RCAUCH
Files Referencend: Unit 6
External References: GAUSS (D103), DGAUSS (D103), MTLMTR (N002),
ABEND (Z035), user-supplied FUNCTION subprogram

Usage:

For t = R (type REAL), t = D (type DOUBLE PRECISION),

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tCAUCH(F,A,B,S,EPS)
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has, in any arithmetic expression, the approximate value of the integral I.

F (type according to t) Name of a user-supplied FUNCTION subprogram, declared EXTERNAL in the calling program. This subprogram must set F(X) = f(X).

A,B (type according to t) End-points of the integration interval. Note that B may be less than A.

S (type according to t) The absissa of the singularity.

EPS (type according to t) Accuracy parameter (see under Accuracy in the in short write-up for GAUSS (D103)).

Method:

The method described in Ref. 1 is used for decomposition of the integral. The resulting integrals are computed by GAUSS (D103).

Accuracy:

See short write-up for GAUSS (D103).

Error handling:

Error D104.1: S = A or S = B.
Error D104.2: The requested accuracy cannot be obtained (see short write-up for GAUSS (D103)).
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. I.M. Longman, On the numerical evaluation of Cauchy principal values of integrals, MTAC (later renamed Math. Comp.) **12** (1958) 205–207.

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