

NAG Library Routine Document

G01MTF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

1 Purpose

G01MTF returns the value of the Landau density function $\phi(\lambda)$, via the routine name.

2 Specification

double precision FUNCTION G01MTF(X)
double precision X

3 Description

G01MTF evaluates an approximation to the Landau density function $\phi(\lambda)$ given by

$$\phi(\lambda) = \frac{1}{2\pi i} \int_{c-i\infty}^{c+i\infty} \exp(\lambda s + s \ln s) ds,$$

where c is an arbitrary real constant, using piecewise approximation by rational functions. Further details can be found in Kölbig and Schorr (1984).

To obtain the value of $\phi'(\lambda)$, G01RTF can be used.

4 References

Kölbig K S and Schorr B (1984) A program package for the Landau distribution *Comp. Phys. Comm.* **31** 97–111

5 Parameters

1: X – ***double precision*** *Input*
On entry: the argument λ of the function.

6 Error Indicators and Warnings

There are no failure exits from this routine.

7 Accuracy

At least 7 significant digits are usually correct, but occasionally only 6. Such accuracy is normally considered to be adequate for applications in experimental physics.

Because of the asymptotic behaviour of $\phi(\lambda)$, which is of the order of $\exp[-\exp(-\lambda)]$, underflow may occur on some machines when λ is moderately large and negative.

8 Further Comments

None.

9 Example

This example evaluates $\phi(\lambda)$ at $\lambda = 0.5$, and prints the results.

9.1 Program Text

```
*      G01MTF Example Program Text
*      Mark 21 Release. NAG Copyright 2004.
*      .. Parameters ..
      INTEGER          NIN, NOUT
      PARAMETER        (NIN=5,NOUT=6)
*      .. Local Scalars ..
      DOUBLE PRECISION X, Y
*      .. External Functions ..
      DOUBLE PRECISION G01MTF
      LOGICAL          A00ACF
      EXTERNAL          G01MTF, A00ACF
*      .. Executable Statements ..
      WRITE (NOUT,*) 'G01MTF Example Program Results'
      IF (A00ACF()) THEN
*          Skip heading in data file
          READ (NIN,*)
          WRITE (NOUT,*)
          WRITE (NOUT,*) '    X              Y'
          WRITE (NOUT,*)
20         READ (NIN,*,END=40) X
*
*          Compute the value of the Landau density function
*
          Y = G01MTF(X)
*
          WRITE (NOUT,99999) X, Y
          GO TO 20
      ELSE
          WRITE (NOUT,*)
          WRITE (NOUT,*) ' ** A valid licence key was not found'
      END IF
40  CONTINUE
*
99999  FORMAT (1X,F4.1,3X,1P,E12.4)
      END
```

9.2 Program Data

G01MTF Example Program Data
0.5 : Value of X

9.3 Program Results

G01MTF Example Program Results

X	Y
0.5	1.6523E-01
