

# NAG Fortran Library Routine Document

## G01PTF

**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

G01PTF returns the value of the first moment  $\Phi_1(x)$  of the Landau density function, via the routine name.

### 2 Specification

```
double precision FUNCTION G01PTF (X)
double precision X
```

### 3 Description

G01PTF evaluates an approximation to the first moment  $\Phi_1(x)$  of the Landau density function given by

$$\Phi_1(x) = \frac{1}{\Phi(x)} \int_{-\infty}^x \lambda \phi(\lambda) d\lambda,$$

where  $\phi(\lambda)$  is described in G01MTF, using piecewise approximation by rational functions. Further details can be found in Kölbig and Schorr (1984).

To obtain the value of  $\Phi_2(x)$ , G01QTF 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  $x$  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.

### 8 Further Comments

None.

### 9 Example

The example program evaluates  $\Phi_1(x)$  at  $x = 0.5$ , and prints the results.

## 9.1 Program Text

**Note:** the listing of the example program presented below uses *bold italicised* terms to denote precision-dependent details. Please read the Users' Note for your implementation to check the interpretation of these terms. As explained in the Essential Introduction to this manual, the results produced may not be identical for all implementations.

```
*      G01PTF 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 G01PTF
EXTERNAL        G01PTF
*      .. Executable Statements ..
WRITE (NOUT,*) 'G01PTF Example Program Results'
*      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 first moment of the Landau density function
*
Y = G01PTF(X)
*
WRITE (NOUT,99999) X, Y
GO TO 20
40 STOP
*
99999 FORMAT (1X,F4.1,3X,1P,D12.4)
END
```

## 9.2 Program Data

G01PTF Example Program Data  
0.5 : Value of X

## 9.3 Program Results

```
G01PTF Example Program Results

X              Y
0.5          -6.2932D-01
```

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