

NAG Library Routine Document

G01QTF

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

G01QTF returns the value of the second moment $\Phi_2(x)$ of the Landau density function, via the routine name.

2 Specification

```
FUNCTION G01QTF (X)
REAL (KIND=nag_wp) G01QTF
REAL (KIND=nag_wp) X
```

3 Description

G01QTF evaluates an approximation to the second moment $\Phi_2(x)$ of the Landau density function given by

$$\Phi_2(x) = \frac{1}{\Phi(x)} \int_{-\infty}^x \lambda^2 \phi(\lambda) d\lambda,$$

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

To obtain the value of $\Phi_1(x)$, G01PTF can be used.

4 References

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

5 Arguments

1: X – REAL (KIND=nag_wp) *Input*
On entry: the argument x of the function.

6 Error Indicators and Warnings

None.

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 Parallelism and Performance

G01QTF is not threaded in any implementation.

9 Further Comments

None.

10 Example

This example evaluates $\Phi_2(x)$ at $x = 0.5$, and prints the results.

10.1 Program Text

```

Program g01qtfe

!      G01QTF Example Program Text

!      Mark 26 Release. NAG Copyright 2016.

!      .. Use Statements ..
Use nag_library, Only: a00acf, g01qtf, nag_wp
!      .. Implicit None Statement ..
Implicit None
!      .. Parameters ..
Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
Real (Kind=nag_wp)         :: x, y
Integer                    :: ifail
!      .. Executable Statements ..
Write (nout,*) 'G01QTF Example Program Results'
Write (nout,*)

!      Check for valid licence prior to calling G01QTF
If (.Not. a00acf()) Then
  Write (nout,*) ' ** A valid licence key was not found'

  Else
!      Skip heading in data file
  Read (nin,*)

!      Display title
  Write (nout,*) '  X          Y'
  Write (nout,*)

d_lp:  Do
  Read (nin,*,Iostat=ifail) x
  If (ifail/=0) Then
    Exit d_lp
  End If

!      Compute the value of the 2nd moment of the Landau density function
  y = g01qtf(x)

!      Display results
  Write (nout,99999) x, y
End Do d_lp
End If

99999 Format (1X,F4.1,3X,1P,E12.4)
End Program g01qtfe

```

10.2 Program Data

```

G01QTF Example Program Data
0.5 : Value of X

```

10.3 Program Results

G01QTF Example Program Results

X	Y
0.5	9.0868E-01
