

## NAG Library Function Document

### nag\_moment\_1\_landau (g01ptc)

#### 1 Purpose

nag\_moment\_1\_landau (g01ptc) returns the value of the first moment  $\Phi_1(x)$  of the Landau density function.

#### 2 Specification

```
#include <nag.h>
#include <nagg01.h>
double nag_moment_1_landau (double x)
```

#### 3 Description

nag\_moment\_1\_landau (g01ptc) 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 nag\_prob\_density\_landau (g01mtc), using piecewise approximation by rational functions. Further details can be found in Kölbig and Schorr (1984).

To obtain the value of  $\Phi_2(x)$ , nag\_moment\_2\_landau (g01qtc) 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 Arguments

1: **x** – double *Input*  
*On entry:* the argument  $x$  of the function.

#### 6 Error Indicators and Warnings

#### 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

Not applicable.

#### 9 Further Comments

None.

## 10 Example

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

### 10.1 Program Text

```

/* nag_moment_1_landau (g01ptc) Example Program.
 *
 * Copyright 2014 Numerical Algorithms Group.
 *
 * Mark 7, 2002.
 */

#include <stdio.h>
#include <nag.h>
#include <nag_stdlib.h>
#include <nagg01.h>

int main(void)
{
    /* Scalars */
    double x, y;
    Integer exit_status = 0;

    printf(" nag_moment_1_landau (g01ptc) Example Program Results\n");

    /* Skip heading in data file */
#ifdef _WIN32
    scanf_s("%*[\n] ");
#else
    scanf("%*[\n] ");
#endif

#ifdef _WIN32
    scanf_s("%lf%*[\n] ", &x);
#else
    scanf("%lf%*[\n] ", &x);
#endif

    /* nag_moment_1_landau (g01ptc).
     * Landau first moment function Phi_1(x)
     */
    y = nag_moment_1_landau(x);

    printf("\n  X          Y\n\n");
    printf("  %3.1f    %13.4e\n", x, y);

    return exit_status;
}

```

### 10.2 Program Data

```

nag_moment_1_landau (g01ptc) Example Program Data
0.5 : Value of X

```

### 10.3 Program Results

```

nag_moment_1_landau (g01ptc) Example Program Results

  X          Y
0.5    -6.2932e-01

```

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