NAG C Library Function Document

nag_prob_density_landau (g01mtc)

1 Purpose

nag_prob_density_landau (g01mtc) returns the value of the Landau density function $\phi(\lambda)$.

2 Specification

```
double nag_prob_density_landau (double x)
```

3 Description

nag_prob_density_landau (g01mtc) 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 $\phi'(\lambda)$, nag_prob_der_landau (g01rtc) 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 *Input*

On entry: the argument λ 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.

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

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

9.1 Program Text

```
/* nag_prob_density_landau (g01mtc) Example Program.
 *
 * Copyright 2002 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;
  exit_status = 0;

  Vprintf(" g01mtc Example Program Results\n");

  /* Skip heading in data file */
  Vscanf("%*[^\n] ");

  Vscanf("%lf%*[^\n] ",   &x);

  y = g01mtc(x);

  Vprintf("\n   X          Y\n\n");
  Vprintf("  %3.1f   %12.4e\n", x, y);
  return exit_status;
}
```

9.2 Program Data

```
g01mtc Example Program Data
 0.5  : Value of X
```

9.3 Program Results

```
 g01mtc Example Program Results

   X          Y

  0.5     1.6523e-01
```