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 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 = 0;

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

  /* Skip heading in data file */
  scanf("%*[^\n] ");
  scanf("%lf%*[^\n] ", &x);

  /* 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
```