NAG Library Function Document

nag_prob_der_landau (g01rtc)

1 Purpose

nag_prob_der_landau (g01rtc) returns the value of the derivative $\phi'(\lambda)$ of the Landau density function.

2 Specification

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

3 Description

nag_prob_der_landau (g01rtc) evaluates an approximation to the derivative $\phi'(\lambda)$ of the Landau density function given by

$$\phi'(\lambda) = \frac{d\phi(\lambda)}{d\lambda},$$

where $\phi(\lambda)$ is described in nag_prob_density_landau (g01mtc), using piecewise approximation by rational functions. Further details can be found in KÎlbig and Schorr (1984).

To obtain the value of $\phi(\lambda)$, nag_prob_density_landau (g01mtc) 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** – double *Input*

On entry: the argument λ 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.

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 Parallelism and Performance

nag_prob_der_landau (g01rtc) is not threaded in any implementation.

9 Further Comments

None.

10 Example

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

10.1 Program Text

```
/* nag_prob_der_landau (g01rtc) Example Program.
 *
 * NAGPRODCODE Version.
 *
 * Copyright 2016 Numerical Algorithms Group.
 *
 * Mark 26, 2016.
 */

#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_prob_der_landau (g01rtc) 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_prob_der_landau (g01rtc).
   * Landau derivative function phi'(lambda)
   */
  y = nag_prob_der_landau(x);

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

  return exit_status;
}
```

10.2 Program Data

```
nag_prob_der_landau (g01rtc) Example Program Data
 0.5  : Value of X
```

10.3 Program Results

```
 nag_prob_der_landau (g01rtc) Example Program Results

   X          Y

  0.5     -3.6034e-02
```