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

```c
#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 Köhlgig and Schorr (1984).

To obtain the value of $\phi(\lambda)$, nag_prob_density_landau (g01mtc) can be used.

4 References


5 Arguments

1:  x – double  

   *Input*

   *On entry:* the argument $\lambda$ 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 $\lambda$ is moderately large and negative.

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.
10 Example

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

10.1 Program Text

```c
/* nag_prob_der_landau (g01rtc) 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_prob_der_landau (g01rtc) Example Program Results\n");

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

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

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

    printf(" X Y\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

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>-3.6034e-02</td>
</tr>
</tbody>
</table>