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

2 Specification
#include <nag.h>
#include <nagg01.h>
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 Kölblig and Schorr (1984).

To obtain the value of $\phi'(\lambda)$, nag_prob_der_landau (g01rtc) 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

/* nag_prob_density_landau (g01mtc) Example Program. */
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* Mark 7, 2002.
*/
#include <stdio.h>
#include <nag.h>
#include <nag_stdlib.h>
#include <nagg01.h>

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

    printf(" nag_prob_density_landau (g01mtc) 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_density_landau (g01mtc).
    * Landau density function $\phi(\lambda)$ */
    y = nag_prob_density_landau(x);

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

10.2 Program Data

nag_prob_density_landau (g01mtc) Example Program Data
0.5 : Value of X

10.3 Program Results

nag_prob_density_landau (g01mtc) Example Program Results

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1.6523e-01</td>
</tr>
</tbody>
</table>