1 Purpose

nag_bessel_i1_scaled (s18cfc) returns a value of the scaled modified Bessel function $e^{-|x|} I_1(x)$.

2 Specification

```c
#include <nag.h>
#include <nags.h>
double nag_bessel_i1_scaled (double x)
```

3 Description

nag_bessel_i1_scaled (s18cfc) evaluates an approximation to $e^{-|x|} I_1(x)$, where $I_1$ is a modified Bessel function of the first kind. The scaling factor $e^{-|x|}$ removes most of the variation in $I_1(x)$.

The function uses the same Chebyshev expansions as nag_bessel_i1 (s18afc), which returns the unscaled value of $I_1(x)$.

4 References


5 Arguments

1: x – double

   On entry: the argument $x$ of the function.

6 Error Indicators and Warnings

None.

7 Accuracy

Relative errors in the argument are attenuated when propagated into the function value. When the accuracy of the argument is essentially limited by the machine precision, the accuracy of the function value will be similarly limited by at most a small multiple of the machine precision.

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.
10 Example

This example reads values of the argument $x$ from a file, evaluates the function at each value of $x$ and prints the results.

10.1 Program Text

```c
#include <nag.h>
#include <stdio.h>
#include <nag_stdlib.h>
#include <nags.h>

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

    /* Skip heading in data file */
    #ifdef _WIN32
        scanf_s("%*[\n]");
    #else
        scanf("%*[\n]");
    #endif
    printf("nag_bessel_i1_scaled (s18cfc) Example Program Results\n");
    printf("x y\n");
    #ifdef _WIN32
        while (scanf_s("%lf", &x) != EOF)
    #else
        while (scanf("%lf", &x) != EOF)
    #endif
    {
        /* nag_bessel_i1_scaled (s18cfc).
        * Scaled modified Bessel function exp(-|x|) I_1(x)
        */
        y = nag_bessel_i1_scaled(x);
        printf("%12.3e%12.3e\n", x, y);
    }

    return exit_status;
}
```

10.2 Program Data

nag_bessel_i1_scaled (s18cfc) Example Program Data

- 0.0
- 0.5
- 1.0
- 3.0
- 6.0
- 10.0
- 1000.0
- -1.0
10.3 Program Results

nag_bessel_i1_scaled (s18cfc) Example Program Results

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000e+00</td>
<td>0.000e+00</td>
</tr>
<tr>
<td>5.000e-01</td>
<td>1.564e-01</td>
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<tr>
<td>1.000e+00</td>
<td>2.079e-01</td>
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<tr>
<td>3.000e+00</td>
<td>1.968e-01</td>
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<td>6.000e+00</td>
<td>1.521e-01</td>
</tr>
<tr>
<td>1.000e+01</td>
<td>1.213e-01</td>
</tr>
<tr>
<td>1.000e+03</td>
<td>1.261e-02</td>
</tr>
<tr>
<td>-1.000e+00</td>
<td>-2.079e-01</td>
</tr>
</tbody>
</table>