

NAG Toolbox for MATLAB

g05fd

1 Purpose

g05fd generates a vector of pseudo-random numbers taken from a Normal (Gaussian) distribution with mean a and standard deviation b .

2 Syntax

```
[x] = g05fd(a, b, n)
```

3 Description

The distribution has PDF (probability distribution function)

$$f(x) = \frac{1}{b\sqrt{2\pi}} \exp\left(-\frac{(x-a)^2}{2b^2}\right).$$

g05fd uses the Box–Muller method.

The function does **not** generate the same pseudo-random numbers as would n consecutive calls of g05dd, because g05dd uses a different method. However on many machines g05fd is likely to be much faster.

4 References

Kendall M G and Stuart A 1969 *The Advanced Theory of Statistics (Volume 1)* (3rd Edition) Griffin

Knuth D E 1981 *The Art of Computer Programming (Volume 2)* (2nd Edition) Addison–Wesley

5 Parameters

5.1 Compulsory Input Parameters

1: **a – double scalar**

a , the mean of the distribution.

2: **b – double scalar**

b , the standard deviation of the distribution. If **b** is negative, the distribution of the generated numbers – though not the actual sequence – is the same as if the absolute value of **b** were used.

3: **n – int32 scalar**

n , the number of pseudo-random numbers to be generated.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **x(n)** – double array

The n pseudo-random numbers from the specified Normal distribution.

6 Error Indicators and Warnings

None.

7 Accuracy

The generated numbers conform to a Normal distribution with an accuracy of $\sqrt{\textit{machine precision}}$.

8 Further Comments

None.

9 Example

```
a = 1;  
b = 1.5;  
n = int32(5);  
g05za('O');  
g05cb(int32(0));  
[x] = g05fd(a, b, n)
```

```
x =  
    1.1544  
    2.0039  
    1.3299  
    3.0856  
    1.7290
```