Properties of a Gaussian Distribution

This worksheet generates a gaussian distribution for a given average and standard deviation.

Average: $\mu := 0$

Standard deviation: $\sigma := 1$

Amplitude: $A := 1$

The equation for a gaussian distribution (with an amplitude of A):

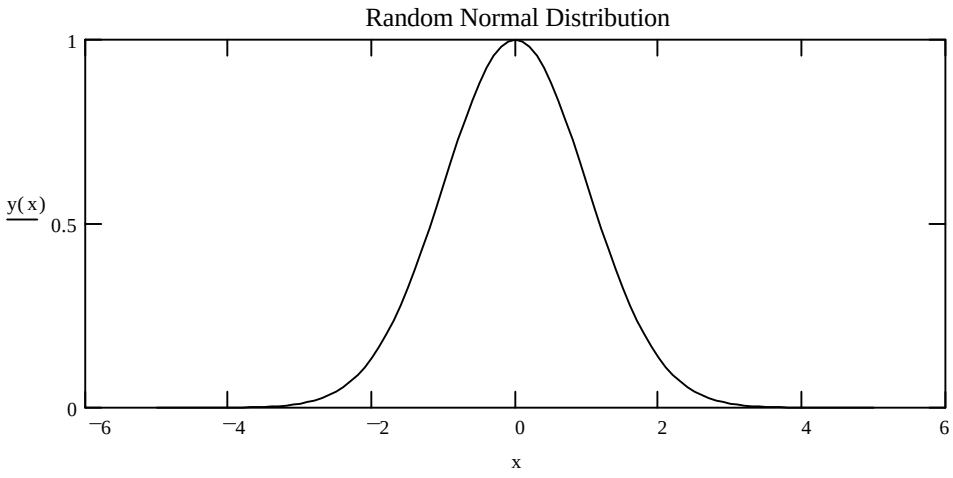
$$y(x) := A \cdot e^{-\frac{1}{2} \cdot \left(\frac{x-\mu}{\sigma}\right)^2}$$

Range to Plot:

$start := -5$

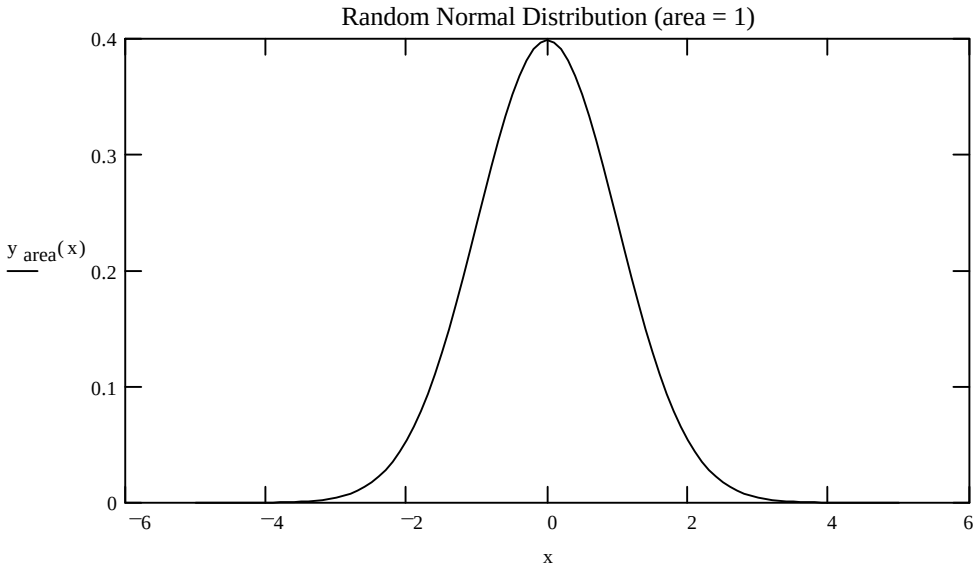
$stop := 5$

$$x := start, \left[start + \left(\frac{stop - start}{100} \right) \right] .. stop$$



Equation for a gaussian distribution with an area of 1:

$$y_{area}(x) := \left(\frac{1}{\sigma \cdot \sqrt{2 \cdot \pi}}\right) \cdot e^{-\frac{1}{2} \cdot \left(\frac{x-\mu}{\sigma}\right)^2}$$

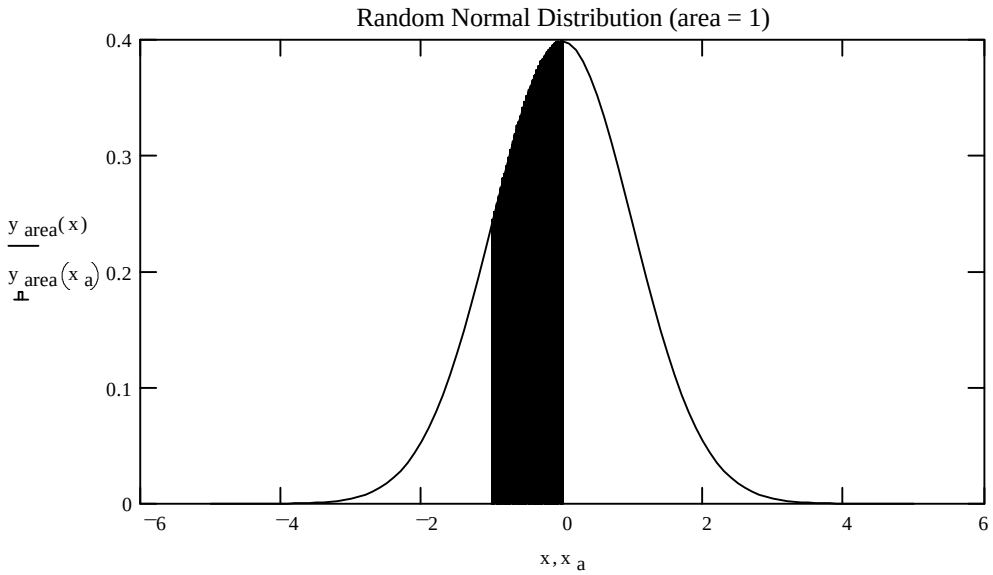


Finding the area under part of a gaussian distribution:

$start := -1$

$stop := 0$

$x_a := start, \left[start + \left(\frac{stop - start}{100} \right) \right] .. stop$



Numerical integration of a gaussian curve (taken using 100 steps):

$$\sum_{x_a} \frac{y_{area}(x_a)}{100} = 0.345$$

Integration of a gaussian curve using calculus:

$$\int_{start}^{stop} \frac{1}{\sigma \cdot \sqrt{2 \cdot \pi}} \cdot e^{-\frac{(x-\mu)^2}{2 \cdot \sigma^2}} dx = 0.3413447461$$

This document prepared by:
S.E. Van Bramer
Department of Chemistry
Widener University
Chester, PA 19013
svanbram@science.widener.edu
http://science.widener.edu/~svanbram