GNUplot

Cumulative distribution function

(*https* : *//en.wikipedia.org/wiki/Normal_distribution*)
The cumulative distribution function (CDF) of the standard normal distibution, usually denoted with the capital Greek letter Φ (phi), is the integral

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-t^2/2} dt$$

The related error function erf((x) gives the probability of a random variable with normal distribution of mean 0 and variance $1/2$ falling in the range $[-x, x]$; that is

$$erf(x) = \frac{2}{\sqrt{\pi}} \int_{0}^{x} e^{-t^2} dt$$

These integrals cannot be expressed in terms of elementary functions, and are often said to be special functions. However, many numerical approximations are known; see below. The two functions are closely related, namely

$$\Phi(x) = \frac{1}{2} \left[1 + erf\left(\frac{x}{\sqrt{2}} \right) \right]$$

For a generic normal distribution with density f, mean μ and deviation σ, the cumulative distribution function is

$$F(x) = \Phi\left(\frac{x - \mu}{\sigma} \right) = \frac{1}{2} \left[1 + erf\left(\frac{x - \mu}{\sigma\sqrt{2}} \right) \right]$$

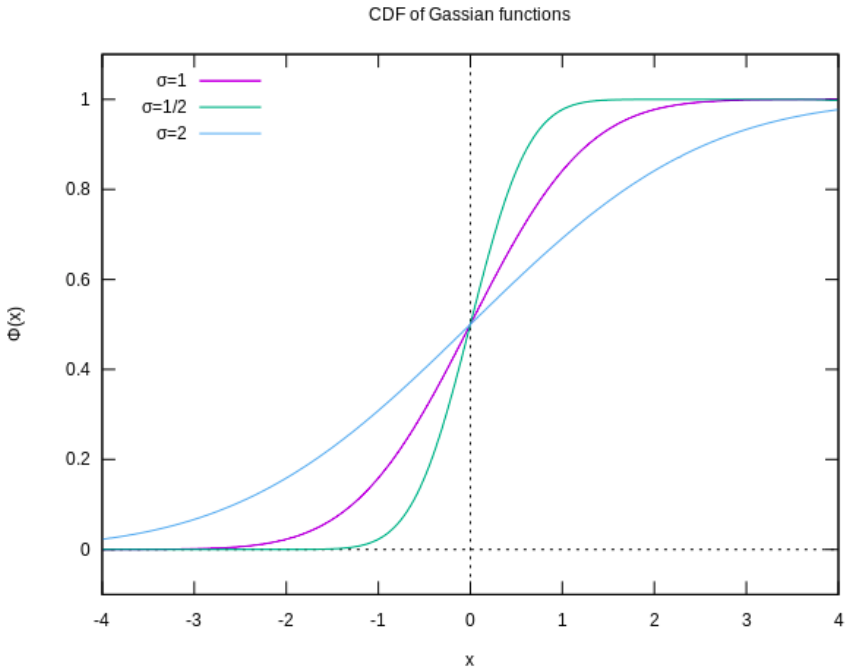

Figure 1: