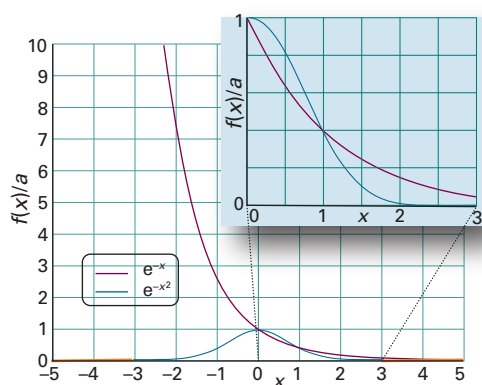


THE CHEMIST'S TOOLKIT 26 Exponential and Gaussian functions

An **exponential function** is a function of the form

$$f(x) = ae^{-bx} \quad \text{Exponential function} \quad (26.1)$$

This function has the value a at $x=0$ and decays toward zero as $x \rightarrow \infty$. This decay is faster when b is large than when it is small. The function rises rapidly to infinity as $x \rightarrow -\infty$. See Sketch 26.1.



Sketch 26.1

The general form of a **Gaussian function** is

$$f(x) = ae^{-(x-b)^2/2\sigma^2} \quad \text{Gaussian function} \quad (26.2)$$

The graph of this function is a symmetrical bell-shaped curve centred on $x = b$; the function has its maximum values of a at its centre. The width of the function, measured at half its height, is $\delta x = 2\sigma(2\ln 2)^{1/2}$; the greater σ , the greater is the width at half-height. Sketch 26.1 also shows a Gaussian function with $b = 0$ and $2\sigma^2 = 1$.