A Gaussian is a function of the form

$$f(x) = Ne^{-\frac{(x-x_0)^2}{2\sigma^2}} \tag{1}$$

Use the applet at Gaussians to explore the role of the parameters N, x_o, and σ in the shape of a Gaussian. Make sure that not only do you know the role of each parameter, but also that you can EXPLAIN this behaviour based on the algebraic expression for the Gaussian function.

Solution

- N is an overall multiplicative factor, so increasing (or decreasing) N increases (or decreases) the overall amplitude (height) of the function.

- x_0 appears in the function in the form $x - x_0$, i.e. it appears as a shift in the value of the independent variable, so increasing (or decreasing) x_0 results in a shift of the graph to the right (or left).

- σ occurs in the denominator of a fraction, with the shifted independent variable $x - x_0$ in the numerator. When σ increases (or decreases), the value of the fraction decreases (or increases). This fraction squared appears in a negative exponent, so as the value of the fraction decreases (or increases), the value of the exponential increases (or decreases) which makes the Gaussian wider (or narrower).