5. The resolution σ is the standard deviation of the data set with larger values representing a large spread in data, and small values representing a narrow spread. $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i-\mu)^2}$; μ = mean.

$$f(x) = \underbrace{\frac{1}{\sigma\sqrt{2\pi}}}_{a} \exp\left[\frac{-(x-\mu)^2}{2\sigma^2}\right]$$

$$\frac{1}{2} f(x_{max}) = a\exp\left[\frac{-(x-\mu)^2}{2\sigma^2}\right]$$

x_{max} at $x_{max} = \mu$.

$$\Rightarrow \frac{1}{2} f(\mu) = a\, e^{-(x-\mu)^2/2\sigma^2} = \frac{1}{2}$$

Scaling factor can be ignored.

$$e^{-(x-\mu)^2/2\sigma^2} = 2^{-1}$$

$$\frac{-(x-\mu)^2}{2\sigma^2} = -\ln 2$$

$$(x-\mu)^2 = 2\sigma^2 \ln 2$$

$$x = \pm\sigma\sqrt{2\ln 2} + \mu.$$

$$\text{FWHM} \equiv x_+ - x_- = 2\sigma\sqrt{2\ln 2} \simeq 2.35\sigma$$

The FWHM is used to describe a measurement of the width of a peak that does not have sharp edges.

The FWHM measures the width of the peak at $\frac{1}{2}$ of its maximum height.