

A continuous rv X has a **normal distribution** with mean μ and variance σ^2 if $X = \mu + \sigma Z$ where Z is standard.

Hence, the probability distribution for X is bell shaped with its peak directly above $x = \mu$ and inflection points directly above $x = \mu - \sigma$ and $x = \mu + \sigma$.

$$\begin{aligned} \text{Also } P(a < X < b) &= P(a < \mu + \sigma Z < b) \\ &= P\left(\frac{a - \mu}{\sigma} < Z < \frac{b - \mu}{\sigma}\right) \end{aligned}$$

Since $E(Z) = 0$ and $V(Z) = 1$, we see immediately that $E(X) = \mu$ and $V(X) = \sigma^2$.