$$\diamondplus$$

Normal Densities

1 Why

We want a density that is symmetric about some central value with some spread.

2 Definition

A normal density is one which can be written as a normalized

Let $f : \mathbf{R} \to \mathbf{R}$ be a density. If there exists $\mu \in \mathbf{R}$ and $\sigma \in \mathbf{R}$ with $\sigma > 0$ so that for each $x \in \mathbf{R}$

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

then f is a *normal density*. Some call a normal density a *Gaussian density*. We often drop the word density and use refer to these as *normals* or *Gaussians*, using these words as substantives.

We call the special case when $\mu = 0$ and $\sigma = 1$ the *standard normal density*.