



## Why

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

## Definition

Let  $f : \mathbf{R} \rightarrow \mathbf{R}$  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*. A normal density is often called a *Gaussian density*.<sup>1</sup> 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* or *standard gaussian density*.

## Maximum

The maximum of a normal density is  $\mu$ .

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<sup>1</sup>We do not use this term in accordance with the Bourbaki project's policy on historical names.



