

The Gaussian

$$\mathcal{P}(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-x_0)^2}{2\sigma^2}} \quad (1)$$

is normalized so that the area under the curve is equal to one. If this Gaussian represents the probability density for a free quantum mechanical particle, what is a possible wavefunction?