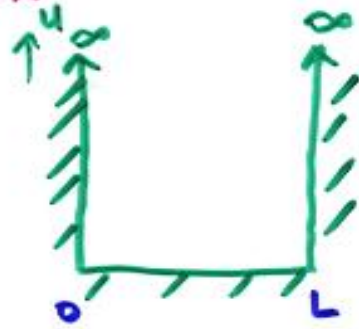


Example #1: Particle in a box

$$U(x) = 0 \quad 0 \leq x \leq L$$

$$U(x) = \infty \quad x < 0$$

$$U(x) = \infty \quad x > L$$



Outside the box; $\psi(x) = 0$

Inside the box; $U(x) = 0$

$$\frac{d^2 \psi(x)}{dx^2} + \underbrace{\frac{2mE}{\hbar^2}}_{k^2} \psi(x) = 0$$

↙

$$\boxed{\psi_n(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)} \quad n = 1, 2, 3, \dots$$

also:

$$\boxed{E_n = \frac{n^2 \pi^2 \hbar^2}{2mL^2}} \quad n = 1, 2, 3, \dots$$

↪ Energy is quantized !!!

$E_1 = \frac{\pi^2 \hbar^2}{2mL^2}$ is the ground state

$E_n = n^2 E_1$ are the excited states.