

9.17: Particle in a Box with Multiple Internal Barriers

Integration limit: $x_{\max} = 1$

Effective mass: $\mu = 1$

Barrier height: $V_0 = 100$

Potential energy:

$$V(x) = \begin{cases} V_0 & \text{if } (x \geq .185)(x \leq .215) + (x \geq .385)(x \leq .415) + (x \geq .585)(x \leq .615) + (x \geq .785)(x \leq .815) \\ 0 & \text{otherwise} \end{cases}$$

Numerical integration of Schrödinger's equation:

Given

$$\frac{-1}{2\mu} \frac{d^2}{dx^2} \psi(x) + V(x)\psi(x) = E\psi(x)$$

$$\psi(0) = 0$$

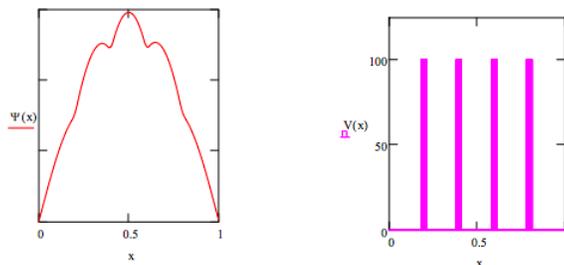
$$\psi'(0) = 0.1$$

$$\psi = \text{Odesolve}(x, x_{\max})$$

Normalize wave function:

$$\psi(x) = \frac{\psi(x)}{\sqrt{\int_0^{x_{\max}} \psi(x)^2 dx}}$$

Enter energy guess: $E = 18.85$



Calculate kinetic energy:

$$T = \int_0^1 \psi(x) \frac{-1}{2} \frac{d^2}{dx^2} \psi(x) dx = 5.926$$

Calculate potential energy:

$$V = E - T = 12.924$$

Tunneling probability:

$$\frac{V}{V_0} \times 100 = 12.924$$

This page titled [9.17: Particle in a Box with Multiple Internal Barriers](#) is shared under a [CC BY 4.0](#) license and was authored, remixed, and/or curated by [Frank Rioux](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.