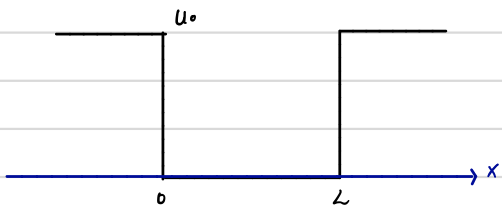
Notas: Mecánica Cuántica. Parte II

§ Pozos de Potencial



Dentro del pozo:

$$\frac{d^2\psi(x)}{dx^2} = -\frac{2mE}{\hbar^2}\psi(x)$$

$$\psi(x) = A\cos\left(\frac{\sqrt{2mE}}{\hbar}x\right) + B\sin\left(\frac{\sqrt{2mE}}{\hbar}x\right)$$

Para $x<0$ y $x>L$:

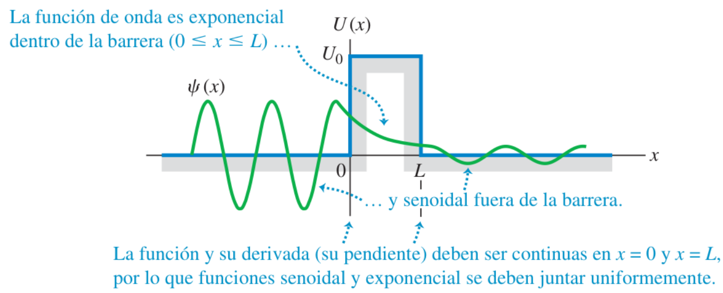
$$\frac{d^2\psi(x)}{dx^2} = \frac{2m(U_0-E)}{\hbar^2}\psi(x)$$

$$\Rightarrow \psi(x) = Ce^{\kappa x} + De^{-\kappa x}$$

§ Barreras de potencial y tunelamiento

$$T = Ge^{-2\kappa L} \quad \text{donde} \quad G = 16\frac{E}{U_0}\left(1-\frac{E}{U_0}\right) \quad \text{y} \quad \kappa = \frac{\sqrt{2m(U_0-E)}}{\hbar} \qquad (40.21)$$

(probabilidad de tunelamiento)



↑ Implica un límite computacional!!

§ El oscilador harmónico

$$U(x) = \frac{1}{2} k x^2$$

$$\therefore \quad -\frac{\hbar^2}{2m} \frac{d^2 \varphi}{dx^2} + \frac{1}{2} k x^2 = E \varphi$$

$$\Rightarrow \quad E_n = \left(n + \frac{1}{2} \right) \hbar \omega \qquad \omega^2 = \frac{k}{m}$$

Oscilador armónico clásico:

$$m \ddot{x} = -k x \quad \Rightarrow \quad m \frac{d^2 x}{dt^2} + k x = 0$$

$$\Rightarrow \quad x(t) = A \cos(kx) + B \sin(kx)$$

$$E = \frac{m \dot{x}^2}{2} + \frac{1}{2} k x^2 \quad \leftarrow \text{no cuantizada.}$$