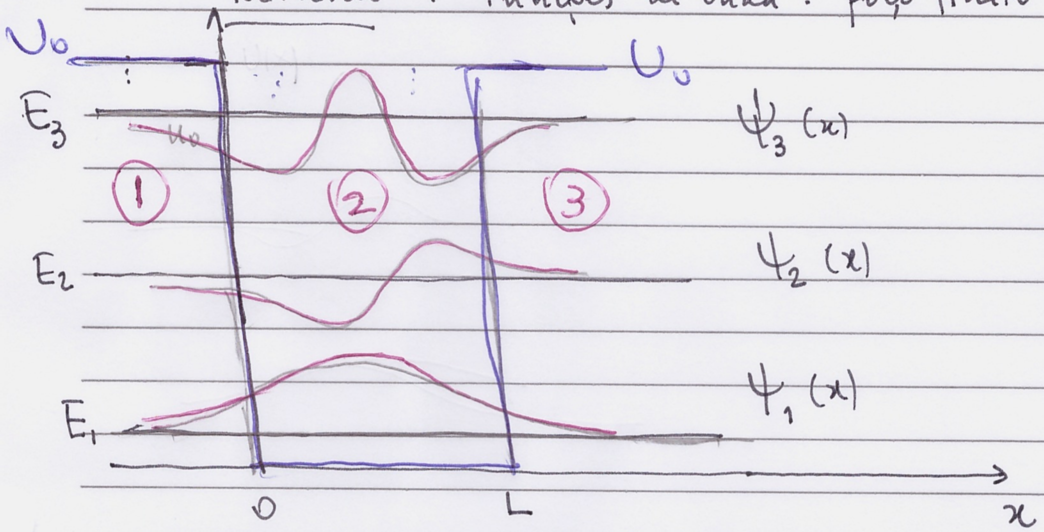
Resumo : Funções de onda : poço finito



$$\begin{cases} \psi_{①}(x) = A e^{\mathbb{C}x} \\ \psi_{③}(x) = B e^{-\mathbb{C}x} \\ \psi_{②}(x) = F e^{ikx} + G e^{-ikx} \end{cases}$$

$$\mathbb{C} \equiv \sqrt{\frac{2m(U_0 - E)}{\hbar^2}}$$

$$k = \sqrt{\frac{2mE}{\hbar^2}}$$

$$\equiv \tilde{F} \cos kx + \tilde{G} \sin kx$$

Exercício : Para a partícula no estado fundamental $\Psi_1(x,t)$, determine a probabilidade de encontrá-la FORA do poço.

$$\Psi_1(x,t) = \psi_1(x)\, e^{-i\frac{E_1}{\hbar}t}$$

$$|\Psi_1(x,t)|^2 = |\psi_1(x)|^2$$

estado fundamental

$$P^{(1)}_{fora} = P(x<0) + P(x>L)$$

$$= \int_{-\infty}^{0} |\Psi_1(x,t)|^2 dx + \int_{L}^{\infty} |\Psi_1(x,t)|^2 dx$$

$$= \int_{-\infty}^{0} |\psi_1^{(1)}(x,t)|^2 dx + \int_{L}^{\infty} |\psi_1^{(3)}(x,t)|^2 dx$$

$$= |A|^2 \int_{-\infty}^{0} e^{2C_1 x} dx + |B|^2 \int_{L}^{\infty} e^{-2C_1 x} dx$$

$$C_1 = \sqrt{\frac{2m(U_0 - E_1)}{\hbar^2}}$$

$$= |A|^2 \left. \frac{e^{2C_1 x}}{2C_1} \right|_{-\infty}^{0} + |B|^2 \left. \frac{e^{-2C_1 x}}{(-2C_1)} \right|_{L}^{\infty}$$

$$= |A|^2 \frac{1}{2C_1} + |B|^2 \left(\frac{-e^{-2C_1 L}}{-2C_1} \right) =$$

$$P^{(1)}_{Fora} = \frac{1}{2C_1} \left(|A|^2 + |B|^2 e^{-2C_1 L} \right)$$