QM. PH101 Oct 31 & Nov 1, 2012

Note Title 31-Oct-12

2-3 pm

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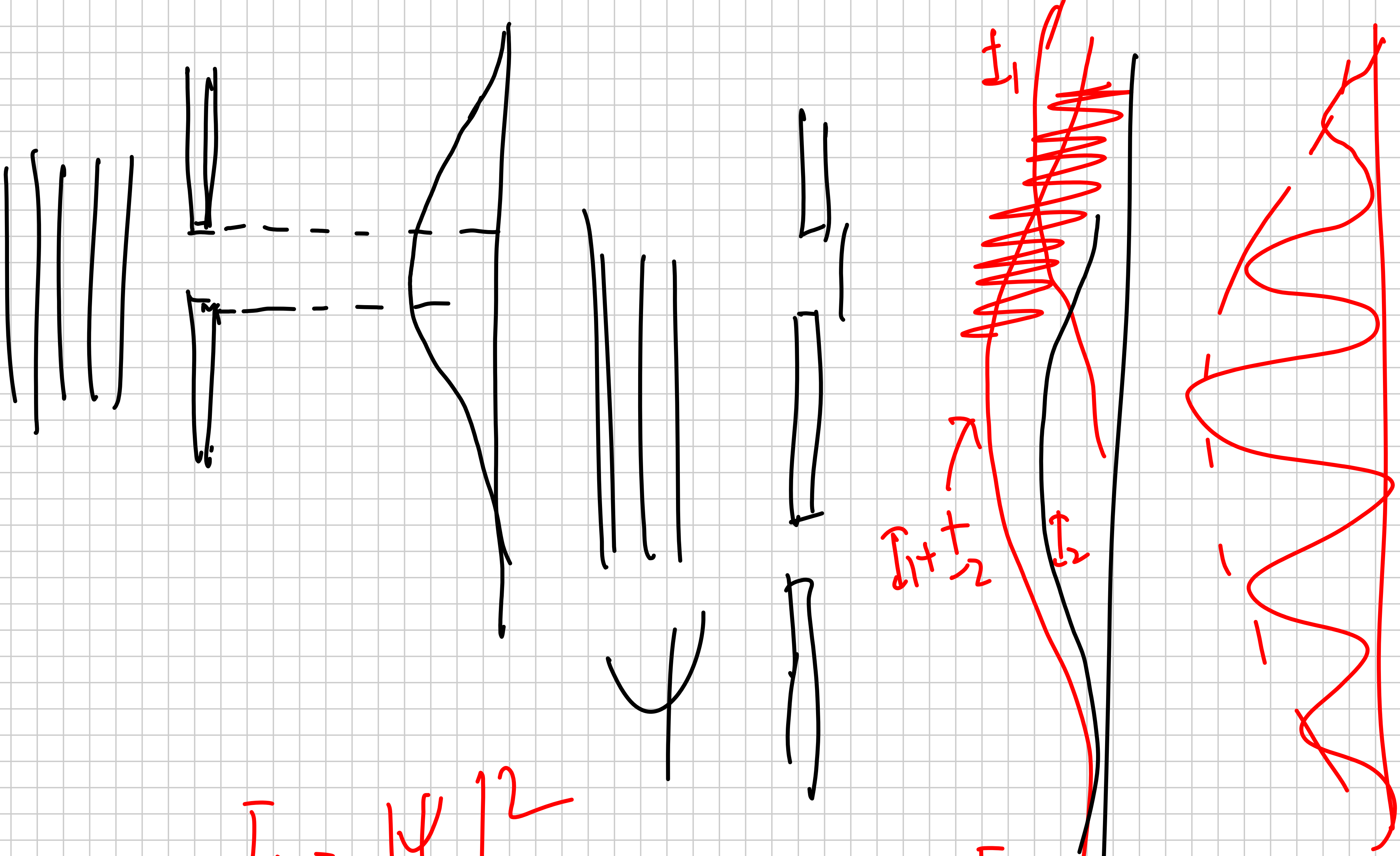
$$\nabla^2\psi = \frac{1}{c^2}\frac{d^2\psi}{dt^2}$$

$$\psi(x,t) = A \exp\left[i\left(\frac{2\pi}{\lambda}x - \frac{2\pi}{T}t\right)\right]$$

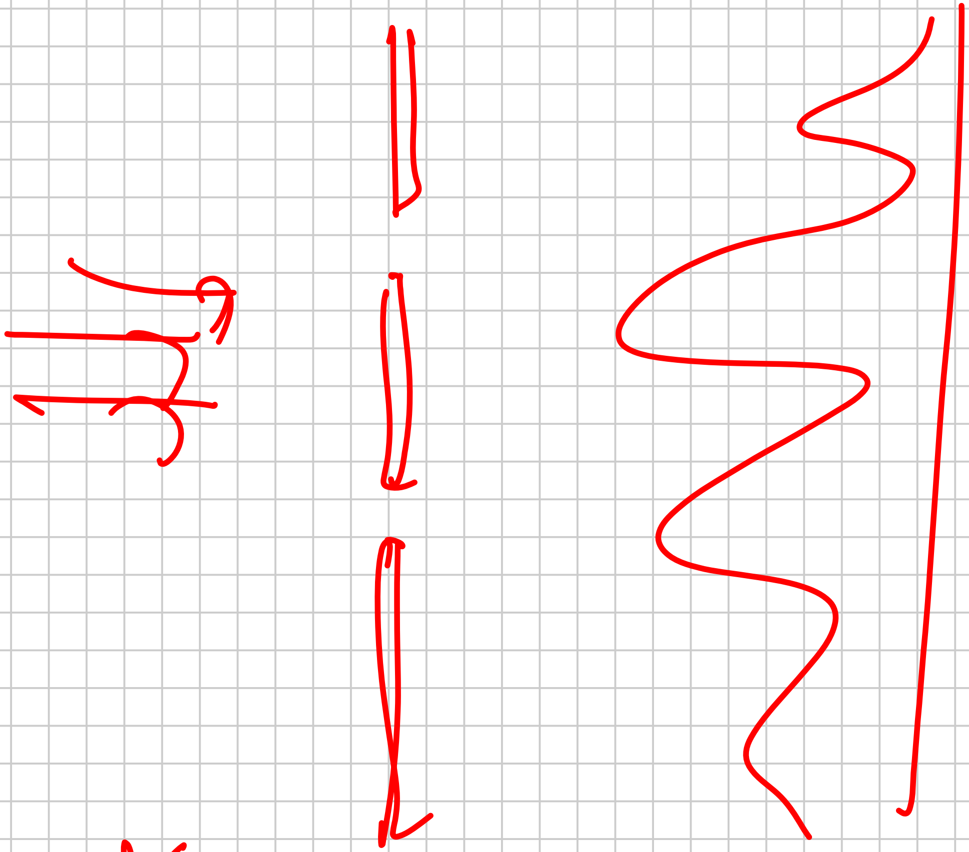
$$= A \exp\left[\underbrace{i\left(\vec{k}\cdot\vec{r} - \omega t\right)}\right]$$

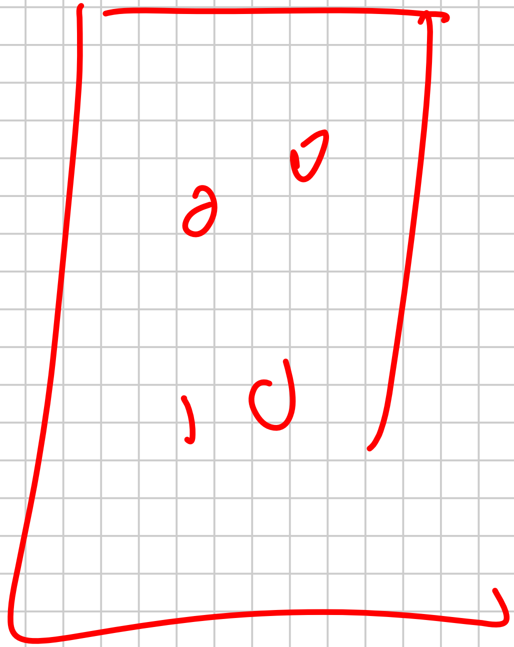
$$A e^{i\phi}.$$

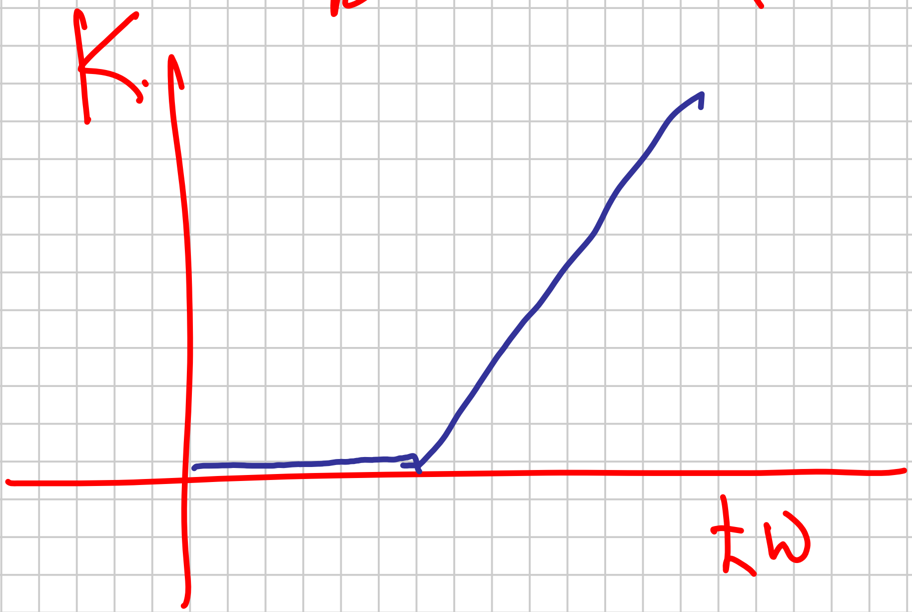


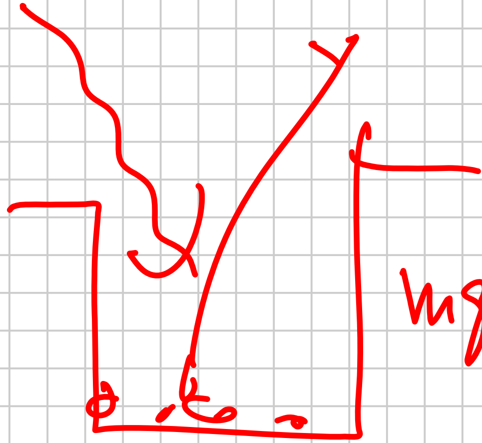
$$I_1 = |\psi_1|^2$$
$$I_2 = |\psi_2|^2$$

$$I \neq I_1 + I_2$$
$$= |\psi_1 + \psi_2|^2$$









$mgh = W$

$$p = \underline{\hbar k} \qquad E = \hbar\omega$$

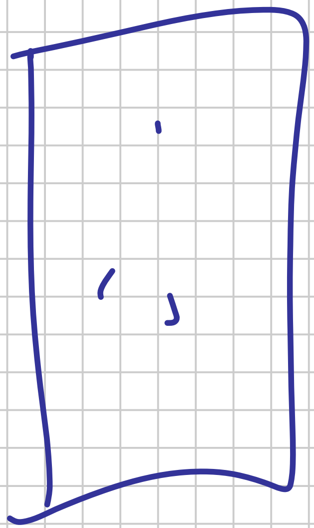
$$E^2 = p^2c^2 + m^2c^4$$

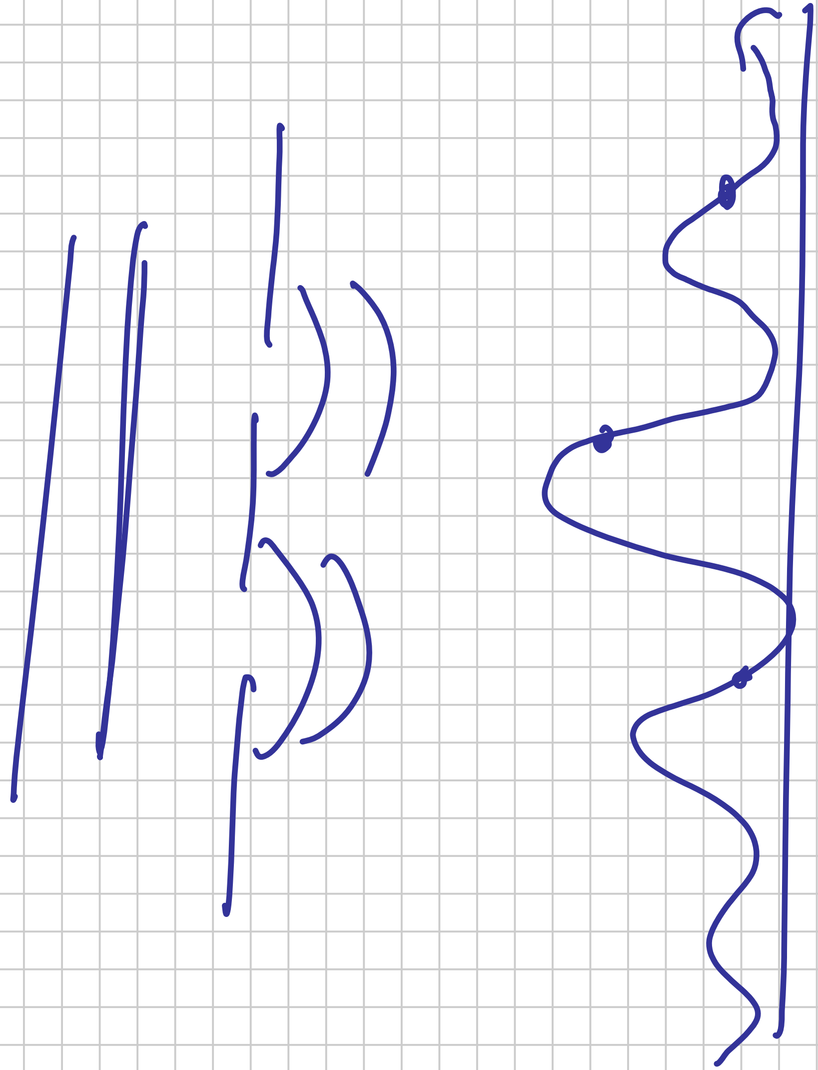
$$\hbar = \frac{h}{2\pi}$$

$$\lambda = \frac{2\pi\hbar}{p}.$$

$$I \neq I_1 + I_2$$

$$= \left|(\psi_1 + \psi_2)\right|^2$$





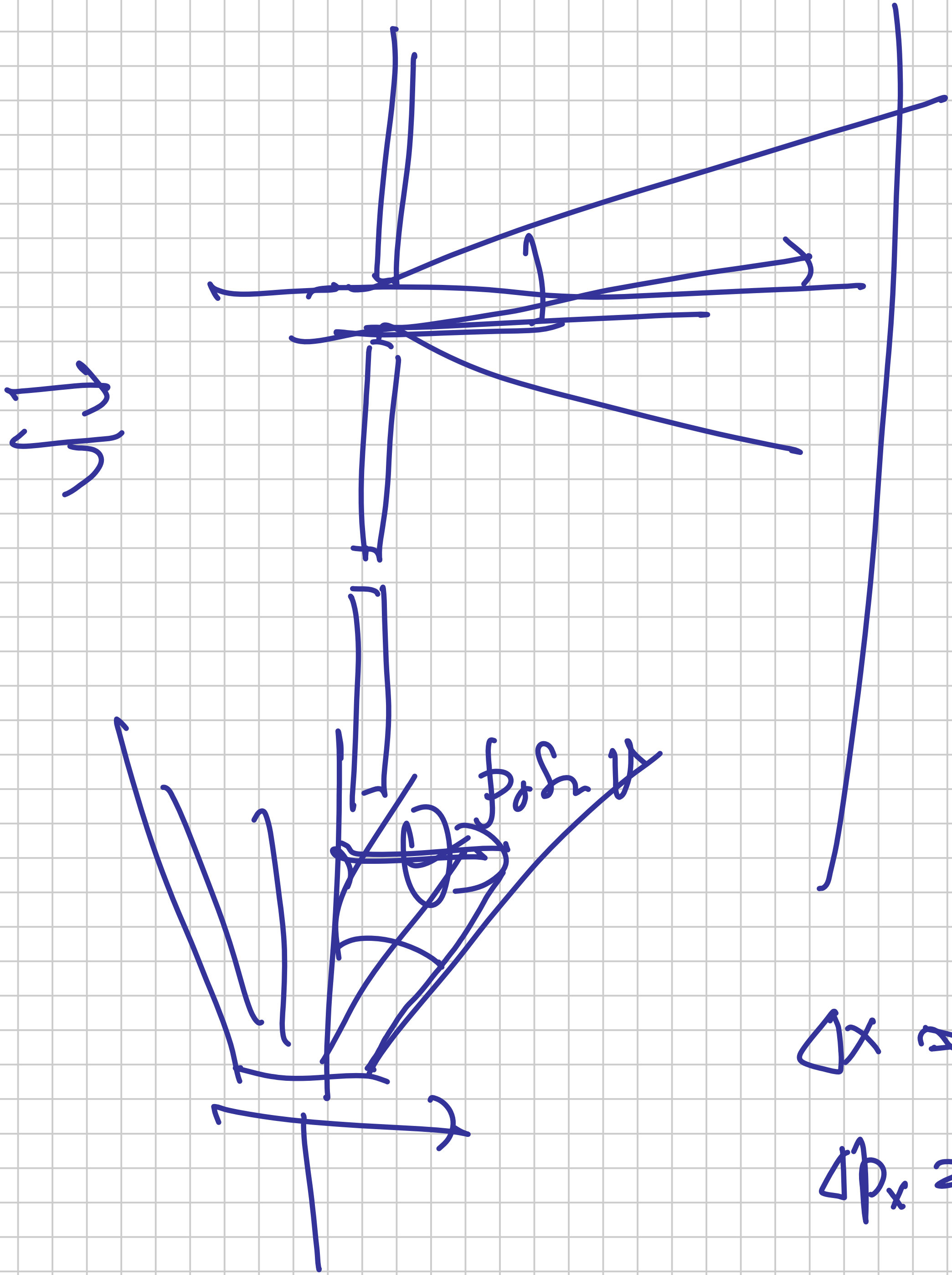
$$E^2 = p^2c^2 + m^2c^4$$

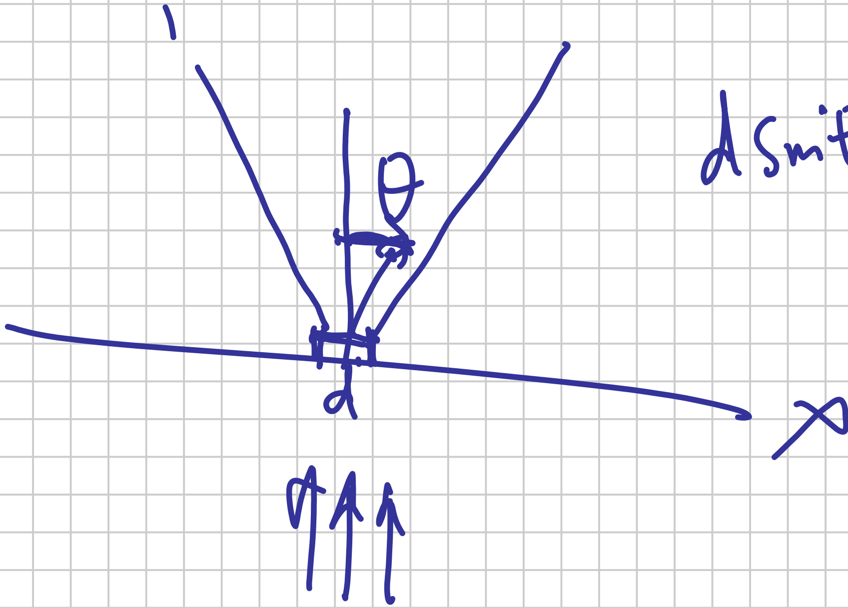
$$E = pc$$

$$= \hbar\omega$$

$$p = \hbar k$$

de Broglie $\lambda = \frac{2\pi\hbar}{p}$





$d \sin\theta = \lambda$

$$\Delta x \approx d$$

$$\Delta p_x \approx p_0 \sin\theta = p_0 \frac{\lambda}{d} = \frac{p_0}{d} \cdot \frac{2\pi\hbar}{p_0} = \frac{2\pi\hbar}{d}$$

$$\underline{\Delta x \, \Delta p_x} = d \cdot \frac{2\pi\hbar}{d} = 2\pi\hbar = \underline{h}$$

$$\Delta x \, \Delta p \sim h$$

$$\boxed{\Delta x \, \Delta p_x \geq \hbar/2}$$

$$|\psi|^2 =$$

$$\sum_i P(i) = 1 \qquad \int_{\text{all Space}} |\psi(x)|^2 \, \underline{dx} = 1$$

Normalization Condition

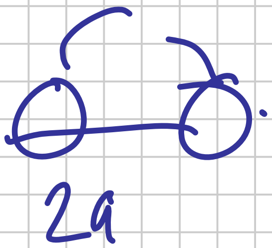
$$\psi(x) = \underline{A}\, e^{ikx}$$

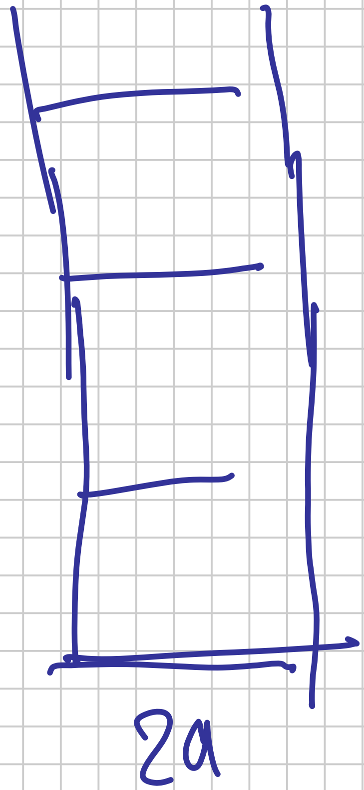
$$\psi(x) = A \qquad |x| < a$$

$$= 0 \qquad |x| > 0$$

$$|A|^2 2a = 1 \Rightarrow A = \frac{1}{\sqrt{2a}}$$

$V = 0$





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$$V(x) = 0$$

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

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

$$\psi(x) = Ae^{ikx} + Be^{-ikx}$$

$$E = \frac{\hbar^2 k^2}{2m}, \quad = \frac{p^2}{2m}$$

$$p = \pm\sqrt{2mE}$$