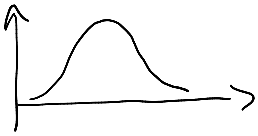
Aula de Dúvidas 5 (extra) (2/Mar)

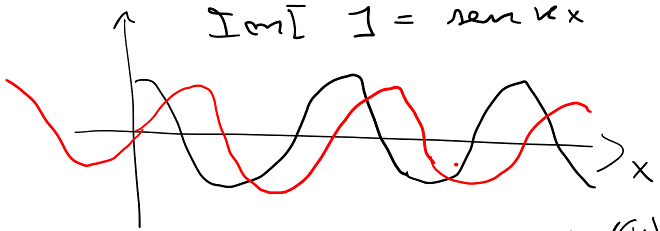
$\psi(x) =$  $= \int_{-\infty}^{+\infty} dk\, \hat{\psi}(k)\, e^{ikx}$

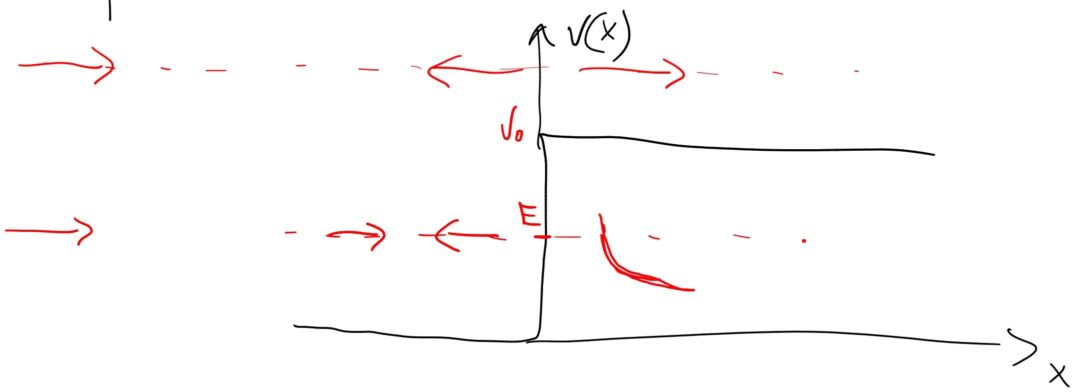
$$= \frac{1}{2} e^{i(k+b)x} + 1\, e^{ikx} + \frac{e^{+i(k-b)x}}{2}$$

$\mathrm{Re}[e^{ikx}] = \cos(kx)$

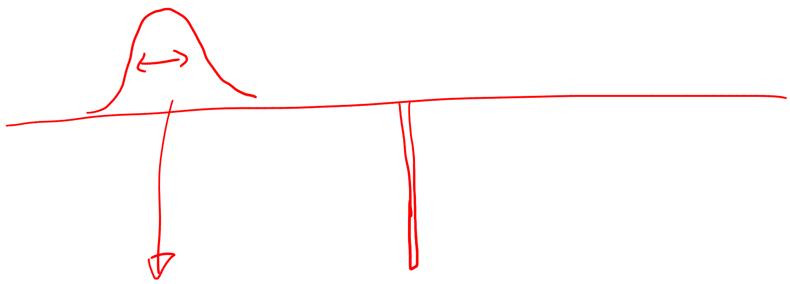
$\mathrm{Im}[\quad] = \operatorname{sen} kx$

$\Rightarrow |e^{ikx}| = 1 \Rightarrow \int_{-\infty}^{+\infty} |e^{ikx}|^2 dx = \infty$





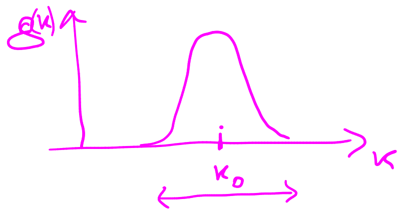
$T(k)$; $R(k)$

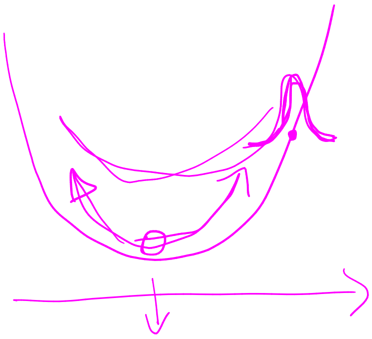


$\int dk\, g(k)\, e^{ikx}$

$T(k)$

$R(k)$

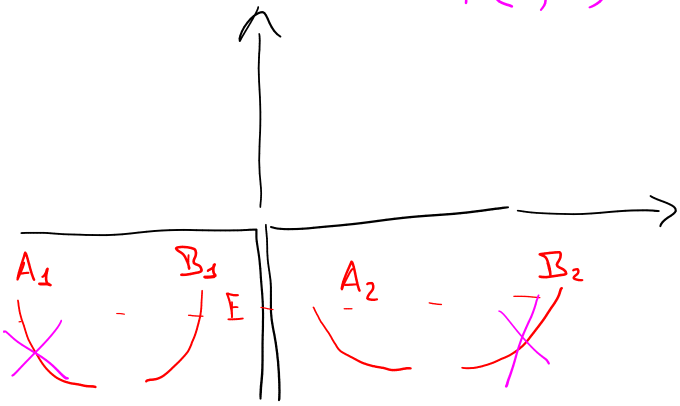


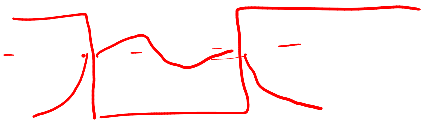


$$\hat{H}\phi_i(x) = E_i\,\phi_i(x)$$

$$\psi(t=0,x) = \sum_i c_i\,\phi_i(x)$$

$$\psi(t,x) = \sum_i c_i\,\phi_i(x)\cdot e^{-\frac{iE_i t}{\hbar}}$$





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

$$\left\{\begin{array}{l} - A_1 - B_1 - - \\ - A_2 - - - B_1 - - . \end{array}\right.$$

$$\Rightarrow K = \dots$$

$$K = \pm\frac{\sqrt{2mE}}{\hbar} = \pm\frac{\sqrt{2m(-|E|)}}{\hbar} = \pm i\,\frac{\sqrt{2m|E|}}{\hbar} = \mathcal{K}$$

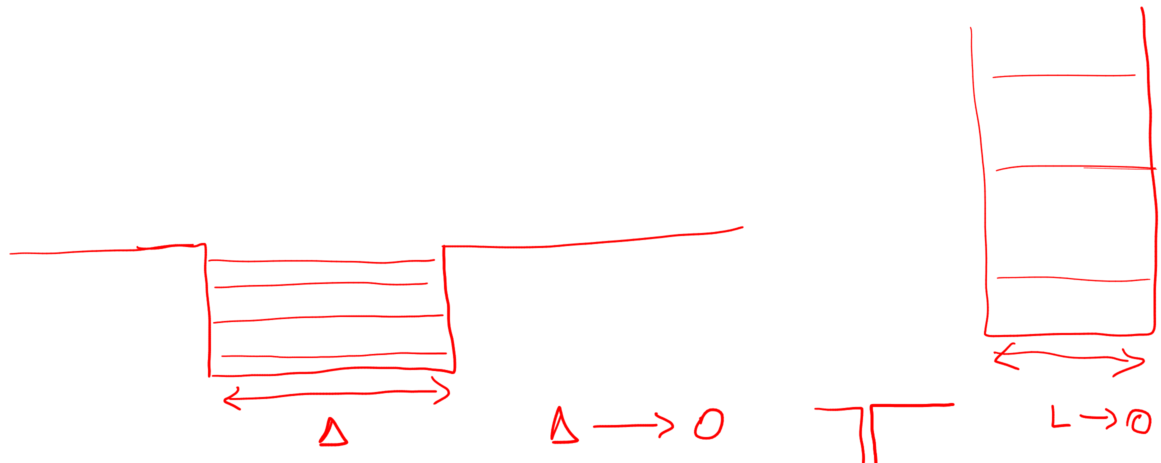
$$\psi(x) = e^{\pm ikx} = e^{\mp \mathcal{K}x}$$

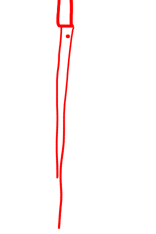
$$E = \frac{\hbar^2 (i\mathcal{K})^2}{2m} = -\frac{\hbar^2 \mathcal{K}^2}{2m}$$

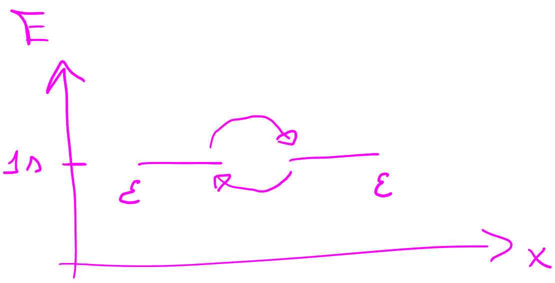
$$-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x}\psi(x) = E\,\psi(x)$$

$$\psi(x) = e^{i\alpha x} \Longrightarrow -\frac{\hbar^2}{2m}(-\alpha^2) = E$$

$$\Longleftrightarrow \frac{\hbar^2\alpha^2}{2m} = E \xRightarrow{\alpha = i\beta} -\frac{\hbar^2\beta^2}{2m} = E$$







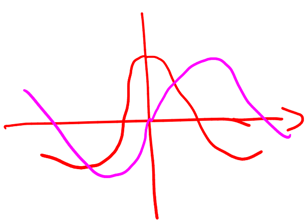
$$H = T + V$$

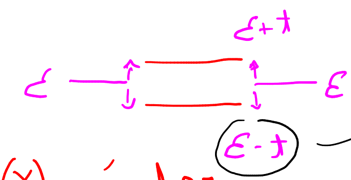
$$= -\frac{\hbar^2}{2m}\nabla^2 - \frac{1}{4\pi\varepsilon_0}\left(\frac{e^2}{r_1} + \frac{e^2}{r_2}\right)$$

$$H = \begin{bmatrix} \varepsilon & -t \\ -t & \varepsilon \end{bmatrix}$$

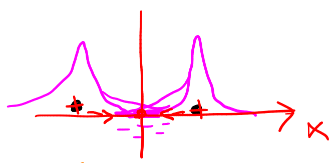
$$= \begin{bmatrix} \varepsilon + t & 0 \\ 0 & \varepsilon - t \end{bmatrix}$$

$$\begin{bmatrix} |\varphi^1_{1s}\rangle \\ |\varphi^2_{1s}\rangle \end{bmatrix} \longrightarrow \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

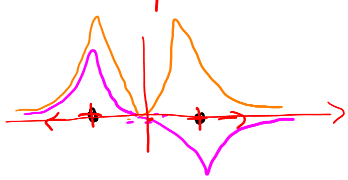




$$\varphi_- = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$



$$\varphi_+ = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 \\ -1 \end{bmatrix}$$



$\psi(x) \xrightarrow{x \to -x} -\psi(x)$ impar

$\psi(x) \longrightarrow \psi(x)$ par