$$i\hbar\frac{\partial\Psi}{\partial x} = -\frac{\hbar^2}{2m}\frac{\partial^2\Psi}{\partial x^2}+V\Psi \tag{1}$$

$$\Psi(x,t) = \psi(x)\varphi(t) \tag{2}$$

$$i\hbar\psi(x)\varphi'(t) = -\frac{\hbar^2}{2m}\psi''(x)\varphi(t)+V\psi(x)\varphi(t) \tag{3}$$

$\psi(x)\varphi(t)$ $\hbar\frac{\varphi'(t)}{\varphi(t)} = E \Rightarrow \frac{d\varphi(t)}{dt} = -\frac{iE}{\hbar}\varphi(t)$ $-\frac{\hbar^2}{2m}\frac{\psi''(x)}{\psi(x)}+V = E \Rightarrow -\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2}+V\psi = E\psi$ **??**

$$\varphi(t) = \exp(iEt/\hbar) \tag{4}$$

?? (time-independent) ??$\psi\Psi$

$$|\Psi(x,t)|^2 = \Psi^*\Psi = \psi^* e^{+iEt/\hbar}\psi e^{-iEt/\hbar} = |\psi(x)|^2 \tag{5}$$

$$H(x,p) = \frac{p^2}{2m}+V(x) \tag{6}$$

$$\hat{H} = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}+V(x) \tag{7}$$

$$\hat{H}\psi = E\varphi \tag{8}$$

$$\sigma_H^2 = \langle H^2\rangle-\langle H\rangle^2 = E^2-E^2 = 0 \tag{9}$$

$$\Psi(x,t) = \sum_{n=1}^{\infty} c_n\psi_n(x)e^{-iE_nt/\hbar} \tag{10}$$

V(x) $\Psi(x0)$ $t = 0$

$$\Psi(x,0) = \sum_{n=1}^{\infty} c_n\psi_n(x) \tag{11}$$

$$\Psi(x,t) = \sum_{n=1}^{\infty} c_n\psi_n(x)e^{-iE_nt/\hbar} = \sum_{n=1}^{\infty} c_n\Psi_n(x,t) \tag{12}$$

$$V(x) = \begin{cases} 0, 0 \le x \le a \\ \infty, else x \end{cases} \tag{13}$$

$V(x) = 0$

$$\hat{H}\psi = -\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2} = E\psi \tag{14}$$

$\psi = A\sin\mu x + B\cos\mu x$ $\mu = \sqrt{\frac{2mE}{\hbar^2}}$ $\psi(0) = \psi(a) = 0$