$$|\psi(t)\rangle = U|\psi(t_0)\rangle$$

$$\langle\psi|\psi\rangle = 1$$

Position and momentum are operators in a quantum mechanical system

$$[\psi] = U[\phi] \Rightarrow U^{\dagger}U = 1$$

Classical

$$\vec{F} = m\vec{a}$$

Quantum

$$i\hbar\frac{\partial}{\partial t}|\psi\rangle = H|\psi\rangle$$

Hamiltonian

→ $TE = \frac{1}{2}kx^2 + \frac{1}{2}mv^2 = \frac{1}{2}m\dot{x}^2 + \frac{1}{2}kx^2$

→ Sloppy way: $\frac{1}{2}\frac{P^2}{m} + \frac{1}{2}kx^2 = [x, P] H$

→ Essentially, solve the equations in $\underline{\underline{x \& P}}$

$$i\hbar\frac{d}{dt}|\psi\rangle = H(x,P)|\psi\rangle$$

$$|\psi\rangle = |\psi(t)\rangle\,|\chi(x)\rangle$$

$$|\chi(x)\rangle\, i\hbar\frac{\partial}{\partial t}|\psi(t)\rangle = H\{\psi(t)\,|\chi(x)\rangle$$

$$i\hbar\frac{\partial}{\partial t}|\psi(t)\rangle = E\,\psi(t) = \psi(t) = e^{i\frac{Et}{\hbar}}\psi(0)$$

$\mathcal{E} = \epsilon$ not epsilon

$$H(x, p)\,|\psi(x)\rangle = \boxed{\mathcal{E}}\,|\psi(x)\rangle$$

eigenvalue

Overall: $|\psi(t, x)\rangle = e^{i\mathcal{E}/\hbar}\,|\psi(0)\rangle$

$$\langle \psi | \psi \rangle = \langle \psi(0)|\, e^{-i\frac{\mathcal{E}}{\hbar}}\; e^{i\mathcal{E}/\hbar}\,\psi(0)\rangle$$

$\psi^* \psi$

$$= \langle \psi(0) | \psi(0) \rangle$$

$$z = a + ib = re^{i\theta}$$

$$\langle \psi(t) | \psi(t) \rangle = \langle \psi(0) | \psi(0) \rangle$$

(rotation of vector) time evolution

Stationary (moving but things don't change)

(static ≠ stationary)

↳ not moving