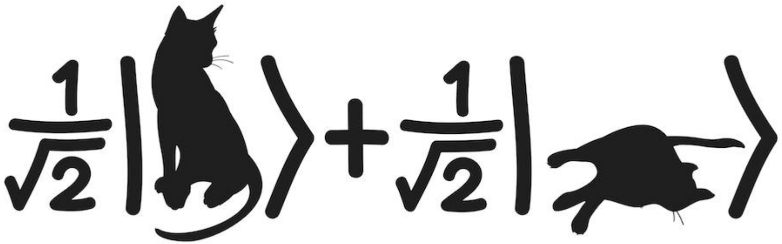
Quantum Mechanics & Quantum Computation



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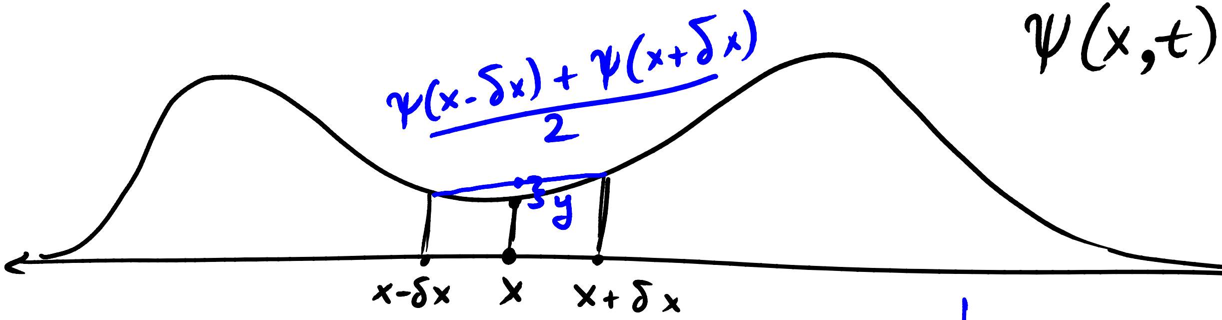
Lecture 9: Continuous quantum states, Schrödinger's equation, uncertainty principle

Schrödinger's equation



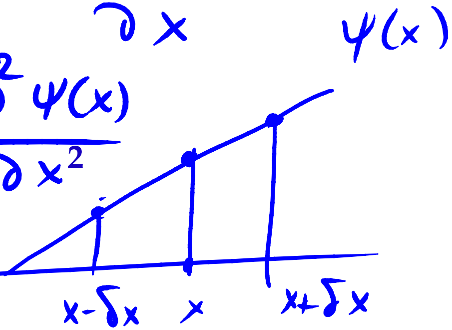
$$\frac{\partial \psi(x,t)}{\partial t} \propto y$$

$$i\frac{\partial \psi(x,t)}{\partial t} = \frac{\partial^2 \psi(x,t)}{\partial x^2}$$

Describe y in terms of $\psi(x)$?

$$y \approx \frac{\partial \psi(x)}{\partial x}$$

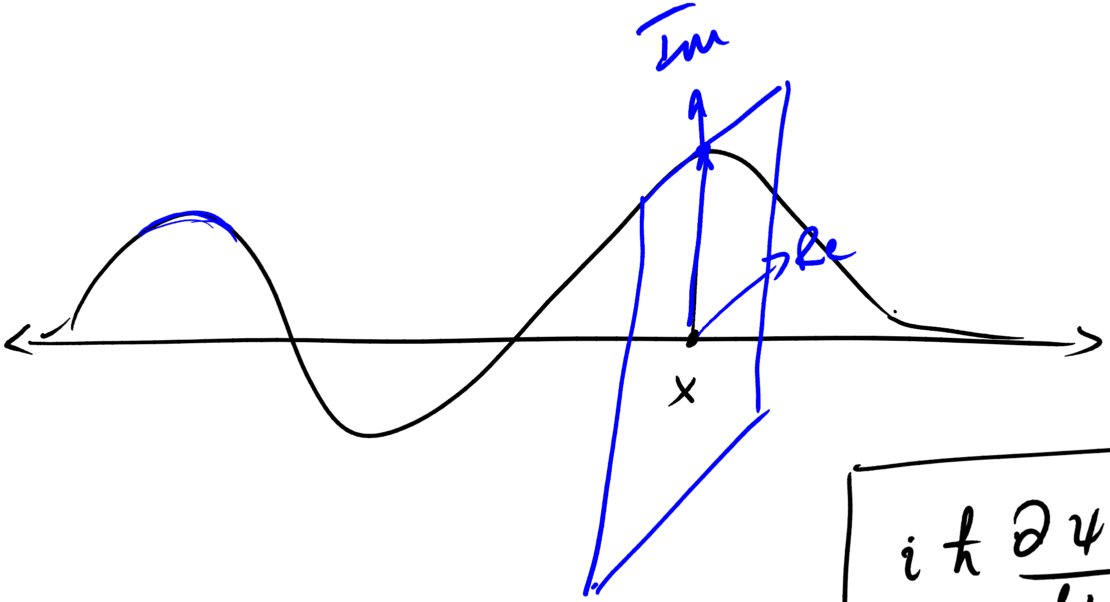
$$y \approx \frac{\partial^2 \psi(x)}{\partial x^2}$$

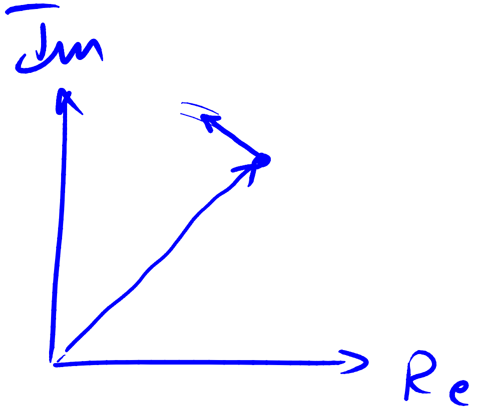


$$\frac{\psi(x-\delta x)+\psi(x+\delta x)}{2} - \psi(x)$$

$$= \frac{\psi(x+\delta x)-\psi(x) - (\psi(x)-\psi(x-\delta x))}{2}$$

$$i \frac{\partial \psi(x,t)}{\partial t} = \frac{\partial^2 \psi(x,t)}{\partial x^2}$$





$$\boxed{i \hbar \frac{\partial \psi}{d t} = - \frac{\hbar^2}{2m} \frac{\partial^2 \psi}{\partial x^2}}$$