Day 4: Terminology

Properties of Functions

Derivative
A derivative measures changes.

Imagine you are a cop and you want to measure how far a car moves in 1 sec (this will tell you the *change in position* with respect to time, or the speed of the car). You would use a speed gun. Now, if you want to measure the *change in speed* of the car (acceleration), you could shoot another speed gun at the first speed gun to measure how quickly the speed is changing. The speed gun is the derivative - something you use to measure change.

Diffusion Equation
Describes how density (of anything - of ink in water, of probability, of heat...) changes in time. If something obeys the diffusion equation, it *spreads out* in time.

Wave Equation
Describes how a wave propagates in time. If something obeys the wave equation, it travels *without spreading out* in time.

Wave Packet
A localized wave made up of individual sine and cosine waves of different frequencies.

Dispersion
Spreading out related to differences in frequency. If a wave packet is composed of individual waves of different frequencies, these individual waves will travel at different speeds. This will cause the wave packet to *disperse*, or spread out.

Infinite
Extends to infinity. This is a mathematical construct, and it is not physically realistic. However, we can use "infinite" as an approximation for something that is very very large relative to something else.

Finite
Not infinite. In reality, everything is finite. However, sometimes treating something as finite is mathematically more challenging than treating it as infinite.

New Terms

Operator

Schrodinger's Equation

Potential Well

Energy Eigenstates (Stationary States)

Quantum Tunneling

Schrodinger vs Heisenburg Picture

Additional Notes: