and the right side of Equation 3.3.22

$$px\ N\ exp(-ix/\hbar)$$

These are the same so this wavefunction is an eigenstate of momentum with momentum $px = -N$.

Let's look at the left side of Equation 3.3.23 for kinetic energy

$$-(\hbar 2/2m)\ \ \partial 2/\partial x2\ N\ exp(-ix/\hbar) = +i(\hbar/2m)\ \ \partial/\partial x\ N\ exp(-ix/\hbar)$$
$$= +1/2m\ \ N\ exp(-ix/\hbar)$$

and the right side

$$KE\ N\ exp(-ix/\hbar)$$

These are same so this wavefunction is an eigenstate of kinetic energy. And the measured kinetic energy will be

$$KE = 1/2m$$

This wavefunction is an eigenstate of both momentum and kinetic energy.

✓ **Exercise 3.3.1**

Are $\psi = M\ exp(-bx)$ functions eigenstates of linear momentum and kinetic energy (or neither or both)?

✓ **Answer**

Ψ is an eigenstate of linear momentum with an eigenvalue of $bi\hbar$ and also an eigenstate of kinetic energy with an eigenvalue of $b2$.

3.4: Wavefunctions Have a Probabilistic Interpretation

✓ **Learning Objectives**

- To understand that wavefunctions can have probabilistic interpretations.
- To calculate the probabilities directly from a wavefunctions

For a single-particle system, the wavefunction $\Psi(r^{\rightarrow}, t), or\ \psi(r^{\rightarrow})$ for the time-independent case, represents the amplitude of the still vaguely defined matter