The solutions to the Schrödinger equation for the particle on a line illustrate several features common to all solutions of the Schrödinger equation.

1. The energy is a real number

2. There are many solutions for each system & the wavefunctions for ~~each~~ the solutions are **orthogonal** to one another. This means

$$\int \psi_N^*(x)\,\psi_M(x)\,dx = \int \psi_M^*(x)\,\psi_N(x)\,dx = \delta_{NM}$$

$$\delta_{NM} = \begin{cases} 0 & \text{if } N \neq M \\ 1 & \text{if } N = M \end{cases}$$

& δ_{NM} is called the Kronecker delta

3. In the Schrodinger equation

$$\hat{\mathcal{H}}\psi = E\psi$$

$\hat{\mathcal{H}}$ is called the Hamiltonian Operator (energy operator)
ψ is called the eigenfunction (wavefunction)
E is called the eigenvalue (energy)