1. Obtain the operators for linear momentum, kinetic energy and total energy starting from wave function $\psi(x) = Ae^{i(kx-\omega t)}$

2. For a particle in a box in its ground state, calculate the expectation value of position, linear momentum, kinetic energy and total energy.

Given $\psi(x) = \sqrt{\frac{2}{L}} \sin\left(\frac{\pi x}{L}\right)$ in the range $0 < x < L$