【物理化学特論】2. Wave function

No. : _____ Name : _____

The wave functions for a particle confined in a one-dimensional well ($0 < x < L$) with impenetrable walls are given as

$$\psi_n(x) = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}, \quad (n = 1, 2, ...)$$

(1) Draw graphs of $\psi_n(x)$ for n=1, 2 and 3.

(2) Confirm that the normalization condition is satisfied for $\psi_1(x)$.

(3) Demonstrate that $\psi_1(x)$ and $\psi_2(x)$ are orthogonal.

(4) Calculate the expectation value of x for the ground state (n=1).

(5) Calculate the expectation value of p_x for the ground state (n=1).