

EXAMPLE PROBLEM 15.3

What is the probability, P , of finding the particle in the central third of the box if it is in its ground state?

Solution

For the ground state, $\psi_1(x) = \sqrt{2/a} \sin(\pi x/a)$. From the postulate, P is the sum of all the probabilities of finding the particle in intervals of width dx within the central third of the box. This probability is given by the integral

$$P = \frac{2}{a} \int_{a/3}^{2a/3} \sin^2\left(\frac{\pi x}{a}\right) dx$$