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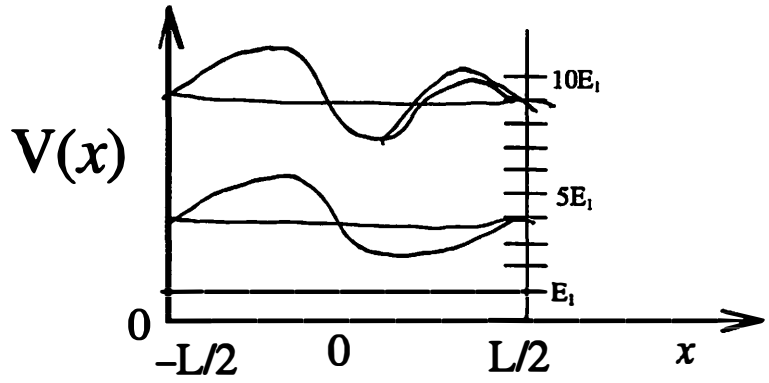
Quiz 2 ANSWERS

1. A. Sketch V(x) for an infinite one-dimensional box,



V(x) = |x| > L/2
V(x) = |x| < L/2

Draw in the energies of the n = 2 and n = 3 levels and specify the number of internal nodes in ψ_3.

$n = 2$ is at $2^2E_1 = 4E_1$, $n = 3$ is at 3^2E_1.

B. Sketch the wavefunction for the state that has one internal node.

$\psi_n(-L/2) = 0$ for $n = 2$ (one node)

C. What is $\psi_n(0)$ for all odd n?

$\psi_n(0) = (-1)^{(n-1)/2} (2/L)^{1/2}$ for all odd–n (antinode)

D. What is $\psi_n(0)$ for all even n?

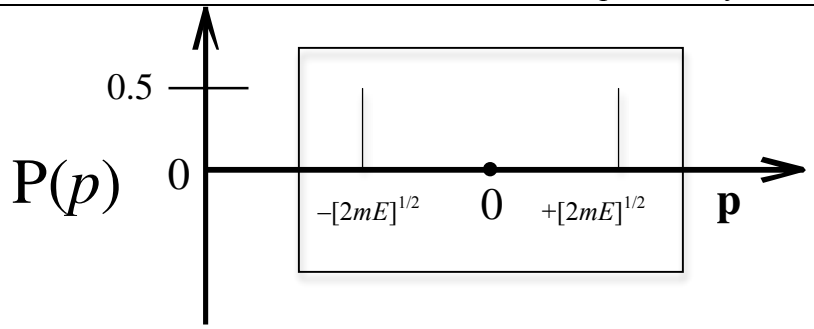
$\psi_n(0) = 0$ for all even n

E. The momentum, p, for the particle inside the box

$$p_n = \pm[2mE_n]^{1/2}.$$

Sketch the probability distribution P(p) for the momentum of a particle in an infinite one-dimensional box.

There are 2 values of P_n for each E_n, both have probability of 1/2.



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