Solution

Consider a particle in an infinite square well. At t = 0 it is in the state:

$$\Psi(x,t) = 0.5\psi_2(x) + A_2\psi_4(x)$$

with $\psi_2(x)$ and $\psi_4(x)$ both normalized.

1. What is A_2? a. 0.5 b. 0.707 **c. 0.866**

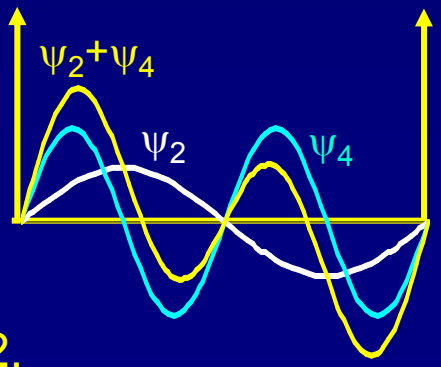
As stated, the question is ambiguous. A_2 could be complex. However, let's assume that A_2 is real.

$A_2 = 0.866\, e^{i\phi}$ also works, for all ϕ.

We are told that $\psi_2(x)$ and $\psi_4(x)$ are both normalized.
Therefore: $0.5^2 + |A_2|^2 = 1 \Rightarrow |A_2| = \text{sqrt}(1 - 0.25) = 0.866$

2. At some later time *t*,
what is the probability density at the center of the well?

a. 0 b. 1 c. It depends on the time *t*.



In general, the probability distribution of a superposition of energy eigenstates depends on time.
However, ψ_2 and ψ_4 each have a node at L/2.
Therefore, every superposition of them also has a node at L/2.