

#1) A particle in the harmonic oscillator potential starts out in the state

$$\Psi(x, 0) = A [3\psi_0(x) + 4\psi_1(x)].$$

[A]. Find A

[B]. Construct $\Psi(x, t)$ and $|\Psi(x, t)|^2$.

[C]. Find $\langle x \rangle$ and $\langle p \rangle$. Don't get too excited if they oscillate at the classical frequency; what would it have been had I specified $\psi_2(x)$, instead of $\psi_1(x)$? Check that Ehrenfest's theorem holds for this wave function.

[D]. If you measured the energy of this particle, what values might you get, and with what probabilities?