PHYS 2210 Spring 2024 Class 08 Worksheet – Piecewise Potentials and Mixed State Expansions

1) Assume you know the energy eigenfunctions $\Psi_i(x,t)$ of the Hamiltonian operator and you find that $\int \psi^*(x)\Psi_2 dx = 0.1$. What is the probability of observing a particle energy of $\hbar\omega_2$ at $t = 0$?

2) A particle is in a state given by $\Psi(x,t) = A\left(\psi_1 e^{(iE_1 t/\hbar)} + 3\psi_2 e^{iE_2 t/\hbar}\right)$ where $E_1 = 1\ eV$ and $E_2 = 5\ eV$ and $\psi_1\ and\ \psi_2$ are normalized wavefunctions.

_____a) What is the expectation value of a large number of energy measurements of this system? Explain.

_____b) What is the most likely measurement of the energy of this system? Explain.

3) The spatial wavefunction of a particle decays monotonically to zero in a particular region of space. What can you say about the eigenenergy of the state relative to the potential energy in that region?