

An electron is prepared in a superposition of two energy eigenstates,  $\psi \propto (3\psi_1 + 2\psi_2)$ .  $\psi_1$  and  $\psi_2$  are individually normalized and have energies of  $E_1 = 2 \text{ eV}$ ,  $E_2 = 5 \text{ eV}$ , respectively.

- a) [4 points] Suppose you measure the electron's energy. What result or results might you obtain?
- b) [6 points] Write an expression for the normalized wave function
- c) [6 points] Consider the time dependence. At  $t = 0$ , the probability density is  $P(x, 0)$ . When is the next time that the probability density  $P(x, t)$  returns to its  $t = 0$  value (i.e.,  $P(x, t) = P(x, 0)$ )? You should give a numerical answer, in seconds.
- d) [4 points] If the energy  $E_2$  is measured, write the complete *normalized* state,  $\psi$ , *after* the measurement, in terms of  $\psi_1$  and  $\psi_2$ .