Physics 115A Tenth Problem Set

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1. Consider an electron in a 'quantum well' with width $L = 1\,\mathrm{nm}$ and depth $V_0 = 1\,\mathrm{eV}$.

   (a) How many bound states are there? Don't forget there are both even and odd bound states.
   (b) What are the energies, relative to the bottom of the well, of the bound states? (This requires some numerical computation, for example, on a spreadsheet).
   (c) Suppose that a photon can be emitted when an electron makes a transition from either an odd to and even bound state, for from an even to an odd state. What energies of photons can be emitted from this quantum well?

2. Exercise 5.3.4 on page 167 of the text.

3. Compute the one-dimensional probability current for the wave function in equation (5.1.14) on page 154 of the text.