Physics 262: Homework #17

1. (2 points) Accelerating charges produce EM radiation. The classical EM wave theory for charges moving with non-relativistic velocities predicts a radiated power by an accelerating charge given by the Larmor formula, $P = \frac{e^2 a^2}{6\pi\epsilon_0 c^3}$, where a is the acceleration and e is the charge.

   If we model the Hydrogen atom as an electron orbiting the nucleus:

   - What is the velocity of the electron in the lowest energy orbit in the Bohr model?
   - What is the orbital radius of the electron in the lowest energy orbit in the Bohr model?
   - What is the centripetal acceleration of the electron in the lowest energy orbit in the Bohr model?
   - What is the power radiated?
   - Estimate how long it would take for the electron to lose all of its energy and spiral into the nucleus.

2. (1 point) Planck found the value of h by fitting his result to the experimental data. Make a plot of the Planck radiation law, $I(\lambda)$ vs λ. Now make plots where the value of h is both a factor of 2 too large and too small. Plot these together on the same graph. Label the axes. Use any plotting software you have at your disposal.

3. (1 point) YF 38.66

4. (1 point) YF 39.39

5. (1 point) YF 39.42

6. (1 point) YF 39.56