This homework is due on Monday, March 1, at class time. Quiz #2 will be on Wednesday, March 3 and cover learning objectives 10.1-14.3.

1. (5 points) Use the Rydberg equation to determine the wavelength that corresponds to the transition in a hydrogen atom between the n=7 state and the n=2 state. To what part of the electromagnetic spectrum does this wavelength belong – radio, microwave, infrared, etc.?

2. (5 points) Determine the deBroglie wavelength of the following:
   a. A 5.2-oz baseball traveling at 90 miles per hour.
   b. An electron traveling at 90 miles per hour.
   c. Based on the answers to parts a and b why are we not concerned with the wavelength of a macroscopic object but must be with a small particle.

3. (16 points) Consider each of the following operators for an electron confined to move on a line of length 10.0 nm. For each operator, determine whether the wavefunction for a particle in a box is an eigenfunction or not. If an eigenfunction, give the eigenvalues. If not an eigenfunction, give the average value of the physical property corresponding to the operator over the entire length of the box with n=1. Note that Barrante has integral tables in the back and you could also use Mathematica or some other approach to evaluate integrals.
   a. Operator = x
   b. Operator = x^2.
   c. Operator = x.
   d. Operator = \frac{\hbar}{i} \frac{\partial}{\partial x}

4. (10 points) Determine the probability of finding an electron in the middle third of a line in the n=1 state and in the n=3 state.