ASTR121 Homework #1 – (Hamilton)
due Thursday Feb. 7 (15 Points)

Start this homework by finishing the relevant reading: Chapter 5. I also recommend testing yourself on the "Review Questions" at the end of each chapter. This is an excellent way to see if you understood the reading. Put in good effort each week, and you'll do better on the homeworks assignments and will not have to cram as much for exams.

1. Practice Scientific Notation with the new and improved tool at http://janus.astro.umd.edu/cgi-bin/astro/scinote.pl. In upper level astronomy and physics classes, being able to work quickly and accurately without the help of a calculator is a very important and useful skill. Try all of the practice problems (conversion, add/subtract, multiply/divide) doing the math in your head (or with just paper and pencil if needed). Then take the quiz in each area until you get a perfect score. Turn in a printout of each completed quiz.

2. Two of the equations that we will make a lot of use of this semester solve for i) F the flux of starlight received by a detector and ii) L the intrinsic luminosity of a star. Go to http://janus.astro.umd.edu/astro/equations/ and check the equations for F and L. Again, without pencil and paper, do these problems until you are consistently getting them all right. Turn in a printout of one problem that you did correctly.

The rest of these problems are from Chapter 5.

*30. Jupiter's moon Io has an active volcano named Pele whose temperature can be as high as 320°C. (a) What is the wavelength of maximum emission for the volcano at this temperature? In what part of the electromagnetic spectrum is this? (b) The average temperature of Io's surface is -150°C. Compared with a square meter of surface at this temperature, how much more energy is emitted per second from each square meter of Pele's surface?

*31. The bright star Sirius in the constellation of Canis Major (the Large Dog) has a radius of 1.67 $R_\odot$ and a luminosity of 25 $L_\odot$. (a) Use this information to calculate the energy flux at the surface of Sirius. (b) Use your answer in part (a) to calculate the surface temperature of Sirius. How does your answer compare to the value given in Box 5-2?

36. Certain interstellar clouds contain a very cold, very thin gas of hydrogen atoms. Ultraviolet radiation with any wavelength shorter than 91.2 nm cannot pass through this gas; instead, it is absorbed. Explain why.

38. An imaginary atom has just 3 energy levels: 0 eV, 1 eV, and 3 eV. Draw an energy-level diagram for this atom. Show all possible transitions between these energy levels. For each transition, determine the photon energy and the photon wavelength. Which transitions involve the emission or absorption of visible light?