ASTR121 Homework #4 – (Hamilton)
due Thursday Feb. 28 (15 Points)

Finishing reading Chapter 17. These problems are from that chapter.

*36. Kapteyn's star (named after the Dutch astronomer who found it) has a parallax of 0.255 arcsec, a proper motion of 8.67 arcsec per year, and a radial velocity of +246 km/s. (a) What is the star's tangential velocity? (b) What is the star's actual speed relative to the Sun? (c) Is Kapteyn's star moving toward the Sun or away from the Sun? Explain.

46. The star Procyon in Canis Minor (the Small Dog) is a prominent star in the winter sky, with an apparent brightness 1.3×10^{-11} that of the Sun. It is also one of the nearest stars, being only 3.50 parsecs from Earth. What is the luminosity of Procyon? Express your answer as a multiple of the Sun's luminosity.

*49. Suppose you can just barely see a twelfth-magnitude star through an amateur's 6-inch telescope. What is the magnitude of the dimmest star you could see through a 60-inch telescope?

52. (a) On a copy of Figure 17-8, sketch the intensity curve for a blackbody at a temperature of 3000 K. Note that this figure shows a smaller wavelength range than Figure 17-7a. (b) Repeat part (a) for a blackbody at 12,000 K (see Figure 17-7c). (c) Use your sketches from parts (a) and (b) to explain why the color ratios b_V/b_B and b_B/b_U are less than 1 for very hot stars but greater than 1 for very cool stars.

60. Suppose a star experiences an outburst in which its surface temperature doubles but its average density (its mass divided by its volume) decreases by a factor of 8. The mass of the star stays the same. By what factors do the star's radius and luminosity change?

67. An astronomer observing a binary star finds that one of the stars orbits the other once every 5 years at a distance of 10 AU. (a) Find the sum of the masses of the two stars. (b) If the mass ratio of the system is $M_1/M_2 = 0.25$, find the individual masses of the stars. Give your answers in terms of the mass of the Sun.