Astro 205. Problem set 2. September 24 2003, due October 1 2003

1. Consider three main sequence stars: (1) the Sun (mass 2×10^{33} gm, luminosity 4×10^{33} ergs/sec). (2) a high mass star, M = 60 $M_\odot$, L = 10^6 $L_\odot$, and (3) a low mass star, M = 0.1 $M_\odot$, L = 10^{-3} $L_\odot$. If all are initially composed of pure hydrogen and "convert mass to energy" via E = 0.007 m c^2, what is the maximum main sequence lifetime of each star in years? (c = 3×10^{10} cm/sec, 1 year = 3.2×10^7 seconds).

2. *Black Bodies* radiate at all wavelengths, but the distribution of the radiation with wavelength depends on the temperature. Roughly

$$\lambda_{\rm max} T \quad = \quad 0.3$$

where $\lambda_{\rm max}$ is the wavelength at which the body is brightest (and is measured in cm) and T is the temperature in K. Calculate $\lambda_{\rm max}$ for T = 6000 K (the Sun); T = 300 K (the Earth): and T = 50 K (a large dust disk around a star). In what part of the electromagnetic spectrum does the peak of the radiation fall? (to help: 1 Angstrom (Å) = 10^{-8} cm; 1 micron = 10^{-4} cm). You'll have to look up these wavelengths in some diagram of the electromagnetic spectrum - one is accessible from the course web page). Which of these wavelengths is observable from the ground?

3. How many planets have been discovered outside the Solar System as of today's date? (see Geoff Marcy's web page, accessible from the course web page. "today" is the day you do this homework.)

4. (no answer required) Try out the binary star orbit simulator on the web page.