HOMEWORK #6 (due start of class Jan 31)

LEARNING GOALS for this assignment:

1. To understand deeper concepts of electromagnetic energy: Flux, luminosity, inverse-square law of brightness, …
2. To apply this understanding in practical situations in modern astronomy.

TO RECEIVE FULL CREDIT:

1. Staple multiple pages and identify yourself by Star Name (worth 5 points!).
2. You must **show how** you derived your answer by writing all the logical steps that led you to it. Follow the format of the "Homework Example" on our Web site.
3. All sentence responses must be typewritten and in complete sentences. You may handwrite any arithmetic. Use good English grammar.
4. **If you work more than three hours on this assignment, you should stop, record your work here, and contact Dr. McCarthy or Mr. Hammer (our Teaching Assistant) for help.**

Electromagnetic Radiation: Flux, Intensity, Luminosity, Magnitudes, …

Part I. In Ryden and Peterson's textbook, read sections 13.1 through 13.3.

Part II. Answer both questions below.

1. The luminosity of the Sun is 3.826×10^{33} erg/s and the radius of the Sun is 6.960×10^{10} cm. Mars is an average distance of 1.524 AU from the Sun. If the typical efficiency of the solar panels on a Martian rover Opportunity is 20% (meaning only 20% of the incident flux is converted into energy) and the solar panels have an area of 1.3 m^2, how many Watts can the fully illuminated solar panels generate (assume normal/perpendicular incidence of sunlight)?

2. The brightest star in our sky, Sirius, has a mass about twice the mass of the Sun, a radius that is approximately 1.7 times larger than the Sun, and a luminosity that is approximately 25 times larger than the Sun. At what distance would a hypothetical planet orbit Sirius to receive the same flux as the Earth receives from the Sun? Which planet in our Solar System orbits at roughly that same distance from the Sun?