HOMEWORK #9 (due start of class Feb 7)

LEARNING GOALS for this assignment:

1. To understand the characteristics of a blackbody spectrum.
2. To understand the terminology associated with blackbodies: Wien's Law, Stefan-Boltzmann Law
3. 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.**

Equilibrium Temperature

Part I. Reading: Kepler's Laws, Orbital Mechanics, and Implications

In Ryden and Peterson's textbook, read pp. 50-53 and sections 3.1-3.4 relating to Gravity, Kepler's Laws, and Orbital Mechanics.

Part II. Continued: The exoplanet system 51 Peg Ab

The first exoplanet to be discovered around a so-called main-sequence star was a half-Jupiter mass planet orbiting very close to the star 51 Pegasi A (m_V = +5.49 mag, D = 15.61 pc).

1. The Sun's surface temperature is 5780 K. Using equation (5.100) in the reading, calculate the ratio of the radius of 51 Peg A to the Sun (R_{Sun}). [NOTE: This question incorporates your answers from Homework #8.]

2. If the planet 51 Peg b orbits at a radius of 0.053 AU in 4.23 days, how many times larger is the incident flux on the planet's atmosphere than the solar flux at the Earth?

Part III. A "Debris Disk" orbiting the star 49 Ceti.

Properties of this star: 25 L_{Sun}, age ~40 Myr, V=5.6; distance ~194 light-years.

3. Based on the spectrum below, what is the temperature of the circumstellar dust? How far from star is this debris in AU?