HOMEWORK #8 (due start of class Feb 5)

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.**

Blackbody Radiation

Part I. In Ryden and Peterson's textbook, read section 5.7 entitled "Blackbody Radiation." The first three pages will be confusing but read them for context. The last four pages should be much more understandable but, still, read to understand the concepts, not the details.

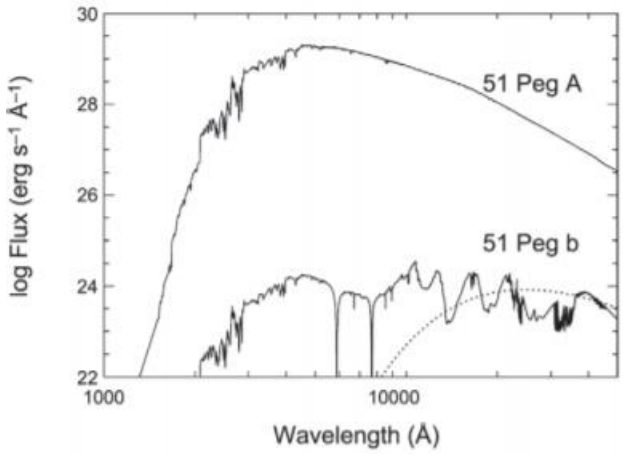
Also, read p. 197 concerning equation 8.4 (Wien's Law).

Part II. Apply the concepts of blackbodies, flux, luminosity, inverse-square law, etc.

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. Calculate the absolute visual magnitude (M_v) of 51 Peg A.

2. The spectrum of 51 Peg A is shown below. Use Wien's Law to calculate the star's temperature. [NOTE: The units of wavelength are Angstroms (Å), where 1 Å = 10^{-10} meters.]



3. Using your answer to question #2 along with the Stefan-Boltzmann Law (equation 5.96), calculate the ratio of the luminosity of 51 Peg A compared to the Sun. The Sun's surface temperature is 5780 K. (NOTE: You may assume the two stars have the same radius.]