ASTR702 - HW1
August 23, 2024, Due August 30, 2024
2 pt for each question part
The appendix of the Big Orange Book has useful numbers

1. The parallax angle for Sirius, known as the "Dog Star", is $0.379''$.
a) Find the distance to Sirius in units of parsecs and cm.
b) What is the distance modulus $(m - M)$ of Sirius?

2. The apparent bolometric magnitude of Sirius A is -1.53.
a) Determine the absolute bolometric magnitude of Sirius A and compare it with that of the Sun.
b) What is the ratio of Sirius A's luminosity to that of the Sun?
c) Given an HR diagram, estimate the spectral class of Sirius A and its effective temperature.
d) Given its luminosity, and this temperature, how would we expect its radius compare to that of the Sun?

3. Sirius has a binary companion, known as Sirius B, or "The Pup Star", which has a temperature of 25,000 K and an apparent magnitude of 8.44.
a) What is its luminosity and how does it compare to the Sun?
b) Given its temperature and luminosity, estimate its radius.

4. The faintest stars seen by the Hubble Space Telescope have a visible band magnitude $m_V \simeq 28$.
a) What is the flux ratio between these stars and the brightest stars (excluding the Sun!) visible in the sky?
b) The Sun has a visual band magnitude of -27 and is 150×10^6 km from the Earth. If the Sun were at a distance of $3\,pc$, what would its magnitude be?

5. (Can use information from Monday's lecture) The average person has 1.4 m^2 (i.e. 1.4×10^4 cm^2) of skin. Consider the average person to emit as a blackbody.
a) Calculate the energy per second radiated by the average person in the form of blackbody radiation in ergs s^{-1}. (Use the expressions in the notes and ignore steradians.)
b) Determine the peak wavelength of the blackbody radiation emitted by the average person. In what regime of the EM spectrum is this wavelength found?