ASTRONOMY 2 — Overview of the Universe
Fifth Practice Problem Set

1. Your body radiates a thermal spectrum of electromagnetic radiation.

(i) At what wavelength is this radiation strongest?

(ii) What kind of electromagnetic waves are you emitting?

(iii) How many times shorter is the wavelength of your radiation than the wavelength of the strongest emission in the Microwave Background Radiation?

2.

(i) Jupiter takes 11.86 years to orbit the Sun. Use this fact to estimate Jupiter's maximum distance from the Earth, and its minimum distance from the Earth.

(ii) Jupiter has .001 times the mass of the Sun. The orbit of the moon Callisto around Jupiter takes approximately 16 days to complete. Estimate the maximum angle that you could observe Callisto separated from Jupiter on the sky.

3. The Sun will reside on the Main Sequence for 10^{10} years. The Main Sequence lifetime of a star is proportional to the star's mass divided by the star's luminosity. If the luminosity of a main-sequence star is proportional to the fourth power of the star's mass, what mass star is just now leaving the main sequence in a cluster of stars that formed:
(i) 400 million years ago.
(ii) 2 billion years ago.

4. If a supernova is 10^{10} times as bright as the Sun, how far away would it have to be in order to appear as bright as the Sun in our sky? Express your answer in light years.

5. A 10-km radius neutron star is spinning 1000 times per second. Calculate the speed of a point on its equator, and compare it with the speed of light. Also, calculate the orbital speed of a particle in a circular orbit just above the surface, if the neutron star's mass is 1.4 times the mass of the Sun.