Astronomy 312 - Fragile
Homework 1 (assigned 1/7/16; due 1/19/16)

(3) 1. (a) Estimate the mass of the Milky Way galaxy inside the radius of the Sun's orbit. Assume the Sun is in a circular orbit of radius $r = 8.5$ kpc. The Sun's circular speed about the center of the Galaxy is $v = 220$ km/s.

(2) (b) Calculate the Sun's orbital period about the Galactic center.

(2) (c) Calculate how many times the Sun has circled the Galaxy since it was born 4.6 billion years ago.

2. The globular cluster IAU C0923-545 has an integrated apparent visual magnitude of $V = +13.0$ and an integrated absolute magnitude of $M_V = -4.15$. It is located 9.0 kpc from Earth and is 11.9 kpc from the Galactic center, just 0.5 kpc south of the Galactic midplane.

(3) (a) Estimate the amount of interstellar extinction between IAU C0923-545 and Earth.

(2) (b) What is the amount of interstellar extinction per kiloparsec?

(4) 3. (a) From the data given in Table 24.1 and using a typical value for the temperature of hydrogen in the interstellar medium of 15 K, estimate the average thermal energy density of hydrogen gas in the disk of the Galaxy. For this problem, assume that the disk has a radius of 8 kpc and a height of 160 pc.

(2) (b) Using Eq. (11.9), estimate the energy density of the magnetic field in the spiral arms.

(1) (c) Compare your answers from parts (a) and (b). Would you expect the magnetic field to play a significant role in the structure of the Galaxy? Why or why not?