

AST 301
Homework #8
Due Friday April 15

1. The Sun is about 25,000 ly from the center of the Milky Way galaxy. It orbits around the center with a speed of about 225 km/s.
 - a) What is the distance of the Sun from the center in kilometers? In AU?
 - b) What is the circumference of the Sun's orbit around the center in kilometers?
 - c) What is the period of the Sun's orbit in seconds and in years? Hint: Use the distance = speed x time formula.
 - d) Use Kepler's 3rd law to calculate the mass (in solar masses) inside of the Sun's orbit. Hint: make sure you use the period and radius of the orbit in the proper units.

2. 3C48 was the first quasar discovered. It has a redshift of $z = \Delta\lambda / \lambda = 0.37$.
 - a) Calculate the speed at which 3C48 moves away from us by using the non-relativistic Doppler shift formula (By the Numbers 6-2).
 - b) Use Hubble's law to calculate the distance to 3C48. Use a Hubble's constant of 70 km/s/Mpc. Give your answer both in Mpc and in light-years.

3. If the luminosity of 3C48 is 10^{13} times the luminosity of α Cen, which is about 1.3 pc from us, how does the flux (apparent brightness) of 3C48 compare to the flux of α Cen? Hint: Ask how many times more distant 3C48 is and how many times fainter this would make it if it had the same luminosity as α Cen. Then combine the effects of distance and luminosity.