Astronomy 150
Winter 08
Sullivan

Homework #3 Due Wednesday Jan 30th

Kepler's Laws and Orbits

These problems accompany the assigned reading in chapter 5, feel free to also learn about Kepler's laws with the 150 tutorial:
`http://www.astro.washington.edu/smith/Astro150/Kepler/Kepler.html`

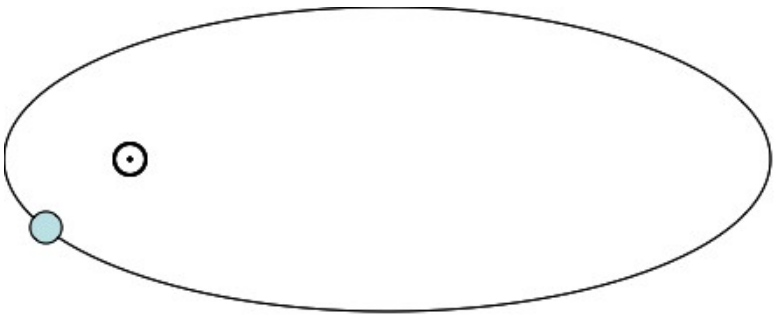

Figure 1: This is an orbit of a comet around a star (not to scale)

1. Mark where in the orbit the comet is traveling the fastest and the slowest and explain your answer.
2. Draw in and label both the ion tail and the dust tail of the comet in the picture, assume that it is orbiting counterclockwise around the star.
3. The four largest moons of Jupiter in increasing distance are Io, Europa, Ganymede, and Callisto. There are moons beyond Callisto. Will they have larger or smaller periods than Callisto? Why? Explain using an equation.
4. Imagine another solar system, with a star of the same mass as the Sun. Suppose there is a planet in that solar system with a mass twice that of Earth orbiting at a distance of 1 AU from the star. What is the orbital period of this planet and how does it compare to Earth's? Explain. *The reasoning for this problem is so simple that you will not need a calculator.*
5. Suppose a planetary system has a star that is four times as massive as our Sun and a planet the same size as Earth orbiting at a distance of 1 AU. What is the orbital period of the planet and how does it compare to Earth's? Explain. *The calculations for this problem are so simple that you will not need a calculator.*
6. In one to two paragraphs, answer the first "Learning to Look" question in chapter 5 on p. 101. (This is a picture of a TV satellite Dish))

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Tides

7. If the Earth had no Moon:

   (a) Would the Earth experience tides? Why or why not?

   (b) How many tides would there be per day? Explain.

   (c) Would there be spring and neap tides? Explain.

Density

8. By analysis of the orbit of an asteroid, suppose that you are able to determine that its mass is 1.0×10^{20} grams. By observation of its image through a telescope, you find that its shape is close to spherical and its radius is 2.6×10^{6} cm. Calculate the asteroid's density and comment of what the likely composition is.