ASTR120 Homework #2 – (Hamilton)
due Thursday Sept. 19 (20 Points)

These problems are all from Chapter 3.

25. The dividing line between the illuminated and unilluminated halves of the Moon is called the terminator. The terminator appears curved when there is a crescent or gibbous moon, but appears straight when there is a first quarter or third quarter moon (see Figure 3.2). Describe how you could use these facts to explain to a friend why lunar phases cannot be caused by Earth's shadow falling on the Moon.

31. (a) The Moon moves noticeably on the celestial sphere over the space of a single night. To show this, calculate how long it takes the Moon to move through an angle equal to its own angular diameter (0.5°) against the background of stars. Give your answer in hours. (b) Through what angle (in degrees) does the Moon move during a 12-hour night? Can you notice an angle of this size? (Hint: See Figure 1.10.)

34. How many more sidereal months than synodic months are there in a year? Explain your answers.

35. Suppose Earth moved a little faster around the Sun, so that it took a bit less than one year to make a complete orbit. If the speed of the Moon's orbit around Earth were unchanged, would the length of the sidereal month be the same, longer, or shorter than it is now? What about the synodic month? Explain your answers.

43. (a) Suppose the diameter of the Moon were doubled, but the orbit of the Moon remained the same. Would total solar eclipses be more common, less common, or just as common as they are now? Explain. (b) Suppose the diameter of the Moon were halved, but the orbit of the Moon remained the same. Explain why there would be no total solar eclipses.

44. Just as the distance from Earth to the Moon varies somewhat as the Moon orbits Earth, the distance from the Sun to Earth changes as Earth orbits the Sun. Earth is closest to the Sun at its perihelion; it is farthest from the Sun at its aphelion. In order for a total solar eclipse to have the maximum duration of totality, should Earth be at perihelion or aphelion? Assume that Earth-Moon distance is the same in both situations. As part of your explanation, draw two pictures like Figure 3.11, one with Earth relatively close to the Sun and one with Earth relatively far from the Sun.

*45. On March 29, 2006, residents of northern Africa were treated to a total solar eclipse. (a) On what date and over what part of the world will the next total eclipse of that series occur? Explain. (b) On what date might you next expect a total eclipse of that series to be visible from northern Africa? Explain.

W1. Go to Astronomical Distances program at http://janus.astro.umd.edu/astro/distance/. How fast can you make the spaceship travel? How quickly can you get to Pluto? If you could drive to Pluto, how long would it take? Try some different speeds - what is the shortest possible travel time to Pluto? At this speed, how long would it take to get to the Pegasus Galaxy (a near neighbor of Andromeda)?