ISP 205
Review Questions,Week 1

This is not required homework. It will not be graded. Answers will be supplied next week.

These questions are intended to help you think about the more important points from my lectures. The exams will ask you about these points, as well as about additional details. But note that the exams will be multiple choice questions.

****

1. What do we mean by "the universe"? *The sum of all the places that we could possibly travel to, if we did not have to worry about how long it would take us to get there. Meaning that it is all parts of space that actually connect together.*

2. Why did the ancient Greek astronomers conclude that the Earth was at the center of the Solar System? What led such smart people to make that mistake? *They looked for a change in the angle between pairs of stars next to each other in the sky. They reasoned that if the Earth was circling the Sun, sometimes it would be closer to the stars (when it was on the near side of its orbit) and sometimes further from the same stars (when it was on the far side of its orbit). They did not detect such a change in angle, so they concluded that the Earth does not move in a circular orbit. Their mistake was that they assumed that the stars are close enough that they should be able to actually detect the angle just using naked eye measurements. Actually, the stars are vastly too far away for that (remember my scale model in which the Solar System fits between us and the football stadium, but has the next star several thousand miles away from us)*

3. What is the major difference between the models of the Solar System put forward by Ptolemy and by Copernicus? *The model of Ptolemy (really just the model derived from the work of the ancient Greeks mentioned in #2) put the earth at the center, with the Sun circling the earth. Copernicus's model (1500 years later) put the Sun at the center.*

4. What is an epicycle, and why was it needed in the model of Ptolemy? *It is the small circle that a planet travels around, while at the same time the center of the epicycle moves steadily along a larger circle that has the earth at its center. This is needed to explain "retrograde motion"… the occasional reversal of the direction in which a planet is seen to move relative to the stars, as seen from Earth.*

5. In Copernicus' model, what causes retrograde motion? What do we even mean by "retrograde motion"? *Retrograde motion is defined above. In Copernicus' model (and in reality), retrograde motion is just an optical illusion as the Earth passes up the other planet due to the difference in their orbital speeds. It is the same sort of thing you see if you pass up a truck on the highway… as you are passing it, the truck will appear to drift backwards relative to the scenery behind it. [See figures 2.26 and 2.27in the textbook].*

6. Why is Copernicus' work often referred to as the *"Copernican Revolution"*? *It no longer made earth be the center of everything. Earth was recognized to be just another planet.*

7. State Kepler's three laws.

    a. *Planets move in ellictical orbits with the sun at one focus.*

    b. *Planets sweep out equal areas in equal amounts of time as they move along their orbits.*

    c. The square of a planet's orbital period is equal to the cube of its semi-major axis: $P^2 = a^3$

8. What is the general shape of a planet's orbit? *An ellipse.*

9. When does a planet move fastest in its orbit? Slowest? *Fastest when closest to sun, slowest when farthest from Sun.*

10. Do the outer planets take more time or less time than the inner planets to complete an orbit around the Sun? *More time. WAY more time.*

11. What was Galileo's strongest proof that Copernicus was correct? *He saw that Venus had changing phases [see Fig. 3.19]*

12. What did Galileo mean when he (reputedly) muttered *"Eppur si muove"*? I don't want just the literal translation… I want to know what he was referring to. *"And yet it moves"… meaning that Earth is going to move around the Sun in its orbit whether or not anybody on Earth happens to know that it is doing so. Nature just does what it does. Scientists try to correctly describe it and then understand what is happening in a logical way.*