

Homework #3 Solutions

Astronomy 10, Section 2

due: Monday, September 20, 2011

Chapter 3; Review Questions

5) If a lunar eclipse occurred at midnight, where in the sky would you look to see it?

During a lunar eclipse, the Moon, Earth, and Sun must lie along a line. There are only two possible positions in the Moon's orbit where this can happen: at the full moon (lunar eclipse) and at the new moon (solar eclipse). If it is midnight and the moon is in its full phase, it will be at its highest possible position in the sky (depends on latitude). If you are in the northern hemisphere, this will be slightly south of your zenith position.

6) Why do solar eclipses happen only at new moon? Why not every new moon?

Solar eclipses happen when the moon is directly between the Earth and the Sun. This corresponds to the New Moon phase. Solar eclipses do not occur every New Moon because of the small tilt of the Moon's orbital plane relative to the ecliptic. Solar eclipses occur when the Earth/Sun/Moon all lie along the line that is the intersection between the ecliptic plane and the Moon's orbital plane.

Chapter 4; Review Questions

5) When Tycho observed the new star of 1572, he could detect no parallax. Why did that result sustain belief in the Ptolemaic system?

If the Earth is orbiting the Sun (and not vice-versa as in the geocentric model), we would be observing the Universe from two different vantage points. This would give us "depth perception" in that we'd be able to distinguish nearby stars from distant stars via the angular shift in position that is parallax. The fact that early astronomers could not detect any measurable parallax either meant that the Universe was much, much larger than imagined or that the Earth is stationary. Incapable to imagining the vast distances between stars in the galaxy, the ancients concluded that the earth must be stationary. This supported the geocentric view of the Universe. On the other hand, the Ptolemaic model held that the stars (indeed, everything beyond the sphere of the Moon) are perfect and unchanging. The observation of a supernova showed that some of the basic assumptions about the heavens were wrong.

6) Does Tycho's model of the universe explain the phases of Venus that Galileo observed? Why or why not?

Tycho's model of the Universe was a mixture of a geocentric and heliocentric model. The earth was at the center, orbited by the Sun. However, the other 5 known planets orbited the Sun. This would allow for the phases of Venus, had Tycho known about them.