AST 301
Test #1
Friday Sep. 17 Name:_____

1. Define these words:
a) Universe
everything everywhere
includes planets, stars, galaxies
b) celestial equator
an imaginary line around the celestial sphere above the Earth's equator
half way between the celestial poles
c) sidereal day
a star day
the time from when a star rises (or sets) until the next time it rises (or sets)
it's a bit shorter than a solar day

2. a) Why is it hotter in Austin in June than it is in December?
The Earth is at the place in its orbit where the northern hemisphere is tipped toward the Sun. This means that the Sun passes closer to overhead in June, so it shines more straight down on the surface of the Earth, rather than at an angle. It also is above the horizon longer.
b) Why do we see different constellations at night in June and in December?
We are at a different place in our orbit. We can't see the stars behind the Sun since they are up in the daytime. So we see the stars that are on the opposite side of the Earth from the Sun.

3. a) How has Venus moved in the sky relative to Spica over the last few weeks?
It has fallen behind Spica. It was leading Spica across the sky. It now trails Spica. Put differently, it has moved to the east of Spica, or it has moved west to east relative to Spica.
b) Venus will be moving retrograde next month. How will its motion differ then?
It will start catching up with Spica. That is, it will move east to west faster than Spica does.

4. a) The Moon will be full on Thursday of next week. At about what time of day or night will it rise then?
It will be on the opposite side of the Earth from the Sun, so the Sun is lighting up the face we see. So it will be high in the sky near midnight, and so it must rise around sunset.
b) If there is an eclipse next Thursday, which type of eclipse (solar or lunar) will it be? Explain how you figured that out.
It would have to be a lunar eclipse, since with the Moon opposite the Sun, the Earth's shadow could be cast on the Moon. (There wasn't actually an eclipse since the Earth's shadow passed above or below the Moon.)

5. How did Kepler's model of the solar system differ from Copernicus' model? Give at least two differences.

1. Kepler had the planets moving on ellipses instead of circles (or actually modified circles).

2. Kepler had accurate formulas for how fast the planets moved. In particular, he knew how the planets' speeds varied from place to place in their orbits and how the orbital periods depended on the average distance from the Sun.

(They both had heliocentric systems, and both said that the reason for retrograde motion was that the inner planets move faster than the outer planets.)

6. Assume my little eraser has a mass of 1 kg and my big eraser has a mass of 2 kg.

a) How does the force of gravity on the two erasers compare? (For which is it greater, and how many times greater, or are they the same?)

The force of the Earth's gravity on an eraser is proportional to its mass, so it is twice as large on the 2 kg eraser. (Although the acceleration of gravity is the same for the two erasers. That's because a larger force is needed to move a more massive object – see part b.)

b) If I push on the two erasers with the same force (and there are no other forces acting on them, not even gravity) how will their motions compare?

a = F/m, so the same force will cause a greater acceleration (and greater speed) for the smaller mass. The 1 kg eraser will move more.