Wednesday Feb 2

Syllabus and class notes are at: www.as.utexas.edu
go to courses, AST301 – Introduction to Astronomy – Lacy

If you want help on homework or anything covered in the course, come to discussion session Thursday at 6:00 in RLM 15.216B.
Or TA or prof. office hours (see syllabus)
Topics for this week

Describe the models of Aristotle, Copernicus, and Kepler. How correct and how accurate was each? How did each explain retrograde motion of the planets?

State each of Kepler’s 3 laws and be able to use them to compare speeds of different planets and of one planet at different points in its orbit.

What arguments did Galileo make in favor of the Copernican model?

What did Newton add to our understanding of Kepler’s laws?

State Newton’s 4 laws. Know what the words in each mean. Apply them to the problem of falling balls.
Motions of the planets

During a night (or day) the planets appear to move across the sky along with the stars, due to the rotation of the Earth.

But from night to night the planets slowly move relative to the stars.

This occurs both because the planets are moving around the Sun and because we are observing them from a moving Earth.

Draw the picture to figure out how they appear to move.
Prograde and retrograde motion

Remember: all objects in the sky move east-to-west during a night due to the west-to-east rotation of the Earth.
Prograde motion is when a planet moves west-to-east relative to the stars.
The Sun and Moon always move prograde.
Retrograde motion is when a planet moves east-to-west relative to the stars.

Looking down on the solar system from the north, prograde motion occurs when the line from the Earth to the object rotates counterclockwise (in the same way the planets actually move).
Retrograde motion occurs when the line rotates clockwise because the Earth passes the planet.
Form groups of four
Two from one row and two from the next

Pick a new leader and scribe.

The explanation I gave for retrograde motion works for Mars, but Venus is a bit different.

Draw the orbits of Venus and the Earth around the Sun, and figure out when Venus is moving prograde and retrograde.

Remember: the prograde direction is the direction the Sun appears to move.

Hand in your papers with names, noting who was the discussion leader and the scribe.
Copernicus and Kepler

Copernicus lived about 500 years ago. Kepler lived about 100 years later.

Copernicus put the Sun at the center of his model, but wanted to keep the planets moving on circular paths at constant speed. His model was no more accurate than those of Aristotle and Ptolemy.

Kepler allowed the planets to move on elliptical paths with varying speeds, according to his 3 rules. His model predicted planetary positions very accurately.
Kepler’s laws (or rules)

1. The planets move on elliptical paths with the Sun at one focus of the ellipse for each planet.

2. The speed of a planet changes during its orbit, moving fastest when it is closest to the Sun and slowest when it is farthest from the Sun.
   
   A line from the Sun to the planet sweeps out equal areas in equal times.

3. Different planets move at different speeds, with a planet in a smaller orbit moving faster than one in a larger orbit. The time for a planet to orbit the Sun depends on the size of its orbit according to the rule:

   \[P^2 = a^3,\]  where \(P\) is in years and \(a\) is in AU