1. a) The three "stars" are moons orbiting Jupiter.
   b) The motion of the planets is complicated. Ptolemy's model explains them in a complicated way.
   c) Step 1: Draw model of moon
       Step 2: Figure out the direction
       The full moon is at 0\(^\circ\).
       The 3rd quarter moon is at 6\(^\circ\).

   * Star

   ☀ Sun
   ☿ Earth
   Noon on Jan 1

2. ☀ Moon now
   ☉ Moon a week ago approximately Full equinox

   Sun moves 90\(^\circ\) in 6 hrs
   Star moves 180\(^\circ\) in 6 hrs.
   and 90\(^\circ\) in 6 hrs.

3. a) For the same mass, the smaller the period, the smaller the orbit.
   Since the new planet's period, 0.01 yr, is smaller than mercury's, its orbit is smaller.
   b) \( P^2 = R^3 \)
   \( R^3 = (0.01)^2 \)
   c) \( R = 0.046 \text{ AU} \)

4. "The Earth is slightly closer to the sun during the winter in the northern hemisphere. As a result, the Earth moves faster along its orbit in the winter (in N.H.). The rotation of the Earth, however, remains a constant. When the Earth is moving around the sun in June, it moves slowly, and the point at which the sun is on the meridian is not affected much by Earth's orbit. However, in December, the Earth moves around the sun faster, and the Earth must rotate more in order for the Sun to be on the meridian on the next day. - Chad McAlvey"