1. A hypothetical planet Upiter orbits the sun. Upiter’s semi-major axis is 5.2 AU. The mass of Upiter is 0.001 that of the sun. The eccentricity is 0.2. For this problem, ignore the other planets.
   a. (4 pts.) Compute Upiter’s specific energy and specific angular momentum. (The specific energy is the energy per unit mass.)
   b. (2 pts.) Compute the period of Upiter using Kepler’s 3rd Law.
   c. (2 pts.) Compute Upiter’s distance when it is closest to the sun.
   d. (5 pts.) Compute Upiter’s speed when it is closest to the sun.
   e. (5 pts.) Sketch the path of the sun. Show Upiter’s position on your sketch. Compute the size of the path.
   f. (1 pt.) Is the sun’s orbit within the sun?
   g. (3 pt.) Compute the sun’s fastest speed in km/s. Can you walk that fast?

2. One way to find planets around other stars is to measure the speed of the stars. The speed changes periodically.
   a. (5 pts.) Find the relationship between the speed of the star and the mass and semi-major axis of the planet.
   b. (3 pts.) Plot speed the speed of the star vs. semi-major axis for a planet having Upiter’s mass.
   c. (5 pts.) Suppose you could measure a speed of 1 m/s. At what orbital distance could you find a planet having Earth’s mass (10^{-6} the mass of the sun)? At what orbital distance could you find a planet with Jupiter’s mass?