**Chapter 13 Written Homework Problems**
**DUE: April 7th at the beginning of class**
**SHOW ALL WORK FOR FULL CREDIT**

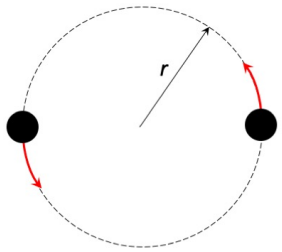
**1.** Using Newton's law of universal gravitation what is the acceleration of gravity at Earth's surface, at the 375-km altitude of the International Space Station, and on the surface of Earth's moon?

**2.** Cavendish used lead spheres having diameters of 5.0 cm and 30.0 cm. What is the gravitational attraction between the spheres when they just touch?

**3.** The US has automated collision monitoring systems that continually look for the possibility of 'impact' events between the Earth and , for example, a large meteorite that could pose a significant danger to life on Earth. Suppose they detect a meteorite with a speed of 50 km/s when it crosses the Earth's orbit. Is it possible the meteorite could return to the vicinity of the Earth?

**4.** What is the escape speed for an object in a circular orbit relative to its speed in that orbit?

**5.** Your book derives Equation 13.12 assuming that one body is sufficiently massive relative to the other that it remains fixed. Suppose instead there are two objects of equal mass *m* orbiting one another in a circular orbit of radius *r* as shown in the Figure. In this case, what is the orbital period in terms of *G*, *m*, *r* and other constants? This is the situation of a binary star when the stars have equal masses.




**6.** The variation in the gravitational force of the Sun and the Moon with position across the Earth result in the 'tidal' forces. *(a)* Estimate the ratio of the tidal force on the Earth due to the Sun, to the tidal force on the Earth due to the Moon. *(b)* From your result in *(a)* does the Sun or the Moon have more influence over the tides on Earth? *(c)* Compare your result in *(a)* to the ratio of the gravitational force on the Earth due to the Sun to the gravitational force on the Earth due to the Moon. *(d)* Can you reconcile your answer to *(c)* with your answer in *(b)*?