

Homework and Class problems

Choose 2 problems for homework and turn in Monday 10/20

All 7 problems will be done in group mode on Tuesday 10/21

1. A mass  $m$  is located somewhere on a line connecting masses  $m_1$  and  $m_2$ , which are separated by a distance  $d$ . Assume  $m_1$  is at  $x = 0$  and  $m_2$  is at  $x = d$ . (a) Where should  $m$  be placed so that the net gravitational force is zero? (b) If  $m$  is displaced a small distance from its equilibrium point and released, does it return to that point or does it move farther away?
2. Four stars, of masses  $m_1$ ,  $m_2$ ,  $m_3$ , and  $m_4$  (reading clockwise from the upper left) are located at the corners of a square whose sides have length  $d$ . What is the net gravitational force on  $m_2$  due to the other stars?
3. An object of mass of 1.0 kg is at the surface of the Earth. (a) What is the gravitational force on the object due to the Earth? (b) What is the gravitational force on the object due to the Sun? (c) What is the gravitational force on the object due to the Moon?
4. (a) Two objects, each of mass 1.0 kg, are located on directly opposite sides of the Earth. The Moon is directly above one of the objects. What is the difference between the force exerted by the Moon on the two objects? (b) What would be the difference between the forces exerted by the Sun on the two objects if the Sun were directly above one of them?
5. Suppose we could dig a tunnel directly through the center of the Earth along a diameter. If an object of mass  $m$  were dropped into the tunnel, how would the weight of the object change as it fell into the hole?
6. (a) A sphere of radius  $R$  and original mass  $M$  has a hole of radius  $R/2$  at its center. What is the gravitational force on a small sphere of mass  $m$  whose center is a distance  $d$  from the center of the large sphere? (b) Suppose the hole in the large sphere is centered at a distance  $R/2$  from the center of the large sphere, in the direction of the line to the small sphere. What is the gravitational force exerted by the large sphere on the small sphere?
7. Imagine that the earth were half the size it is now, but with the same mass. What would the value of  $g$  be?