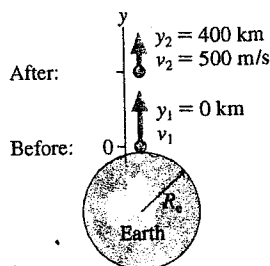
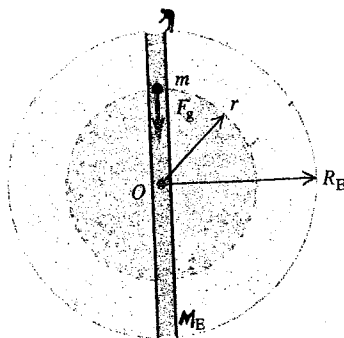


HW Chapter 13 (Gravity)

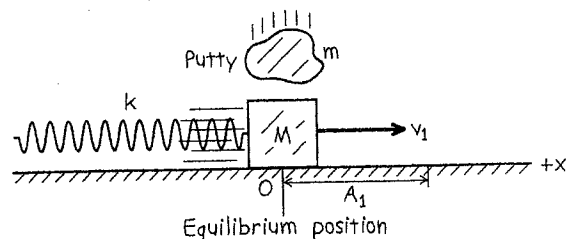
1. A satellite of mass m moves in a circular orbit at height h above the earth surface. You can use the mass of earth, M_E , and radius of earth, R_E . (a) What speed, period, and radial acceleration will it have? (b) Show that the total energy of the satellite is half its potential energy.
2. An inventor wants to launch small satellites into orbit by launching them straight up from the surface of the earth at very high speed. (a) With what speed should he launch the satellite if it is to have a speed of 500 m/s at a height of 400 km? (b) What is the period of the satellite in the orbit? ($M_E = 5.98 \times 10^{24}$ kg, $R_E = 6370$ km)
3. A projectile is fired straight up from the surface of the earth with an initial speed $V_i = 8$ km/s. Find the maximum height it reaches, neglecting air resistance.
4. A particle is projected from the surface of the earth with a speed twice the escape speed. When it is very far from the earth, what is its speed?
5. A hole is drilled from the surface of the earth to its center. Ignore the earth's rotation and air resistance, and model the earth as a uniform sphere of mass M_E and radius R_E . Find (a) How much work is required to lift a particle of mass m from the center of the earth to the earth's surface. (b) If the particle is dropped from rest at the surface of the earth, what is its speed when it reaches the center of the earth? (c) What is the escape speed for a particle projected from the center of the earth? (your answers in term of m , g , and R_E)
6. A block of mass M attached to a horizontal spring with spring constant k is moving in Simple Harmonic Motion with amplitude A_1 . As the block passes through its equilibrium position, a lump of putty of mass m is dropped from a small height and sticks to it. Find the new amplitude and period of the motion.



(2)



(5)



(6)