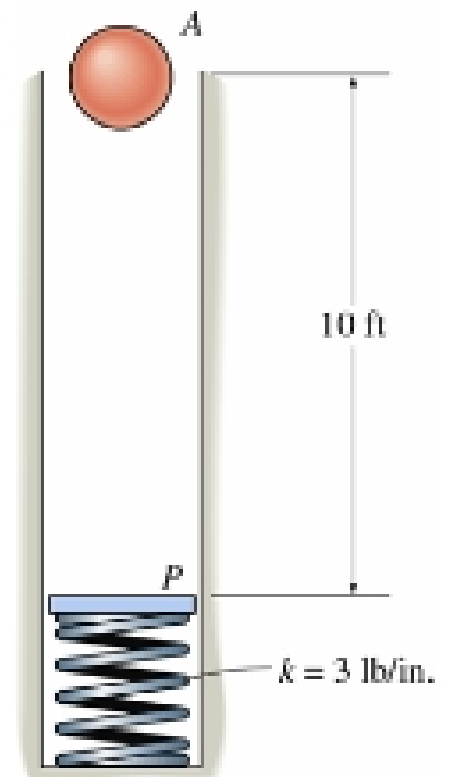
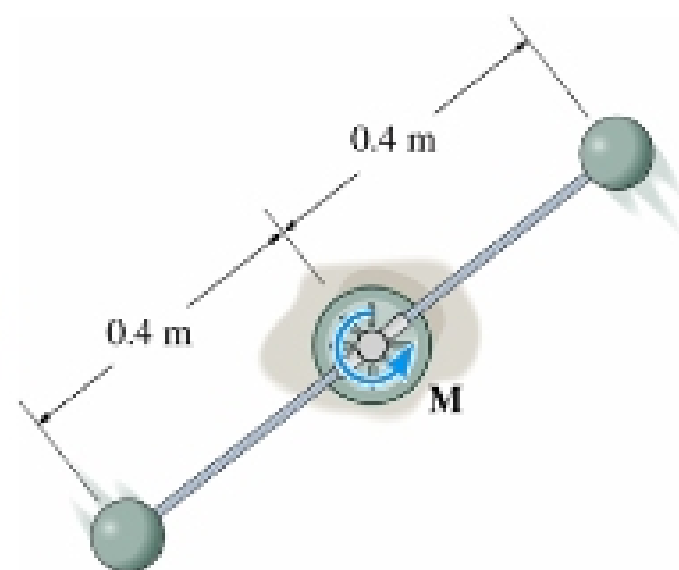


1. (35 pts). A 4-lb ball A is released from rest when it is 10 ft above the surface of the plate P. The size of the ball is negligible. The plate P weighs 12 lb and is in static equilibrium in the position shown supported by the weightless spring with stiffness 3 lb/in (or 36 lb/ft). The coefficient of restitution between the plate and the ball is 0.8. Find:
- How much the spring is compressed in the original static condition before impact
  - How fast is the ball moving just before impact
  - How fast are the ball and the plate moving just after impact
  - What is the total compression in the spring when the plate stops moving instantaneously.



2. (30 pts). Two spheres with mass of 5 kg each and radius of 0.1 m are connected to a 0.6 m uniform rod with mass 2.5 kg. The assembly is at rest when a motor attached at the center is turned on and provides a driving moment  $M = 15t$  where  $t$  is in seconds and the moment is in N-m. The motion occurs in a horizontal plane (the view shown is looking straight down from above).
- (25 pts) Find the time  $t$  required to make the center of gravity of each sphere have a speed of 10 m/s.
  - (5 pts) If the assembly is reoriented so the motion was in a vertical plane, how would your solution change and would the required time increase or decrease? Why?



3. (35 pts) A uniform 40-lb plank rests on the two sawhorses at A and B. Someone lifts end D so it is 2 ft above its original position and then drops it from rest. The impact at B is perfectly plastic ( $e = 0.0$ ) and no slipping occurs at any angle of inclination. How high above the original position does end C rise after the impact?

