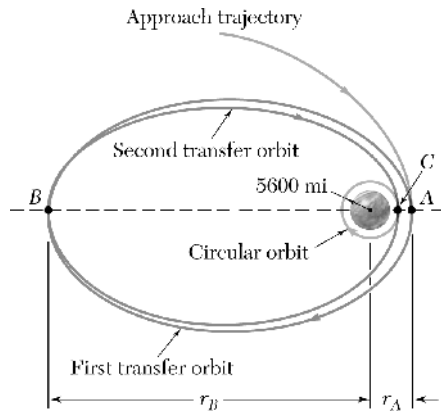


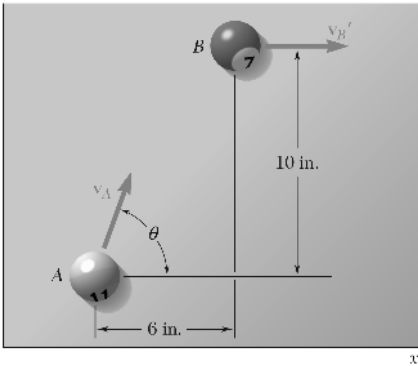
# **ME 104: Midterm II Review**

### Chapter 12, Problem 106



A space probe is to be placed in a circular orbit of 5600 mi radius about the planet Venus in a specified plane. As the probe reaches  $A$ , the point of its original trajectory closest to Venus, it is inserted in a first elliptic transfer orbit by reducing its speed by  $v_A$ . This orbit brings it to Point  $B$  with a much reduced velocity. There the probe is inserted in a second transfer orbit located in the specified plane by changing the direction of its velocity and further reducing its speed by  $v_B$ . Finally, as the probe reaches Point  $C$ , it is inserted in the desired circular orbit by reducing its speed by  $v_C$ . Knowing that the mass of Venus is 0.82 times the mass of the earth, that  $r_A = 9.3 \times 10^3$  mi and  $r_B = 190 \times 10^3$  mi, and that the probe approaches  $A$  on a parabolic trajectory, determine by how much the velocity of the probe should be reduced (a) at  $A$ , (b) at  $B$ , (c) at  $C$ .

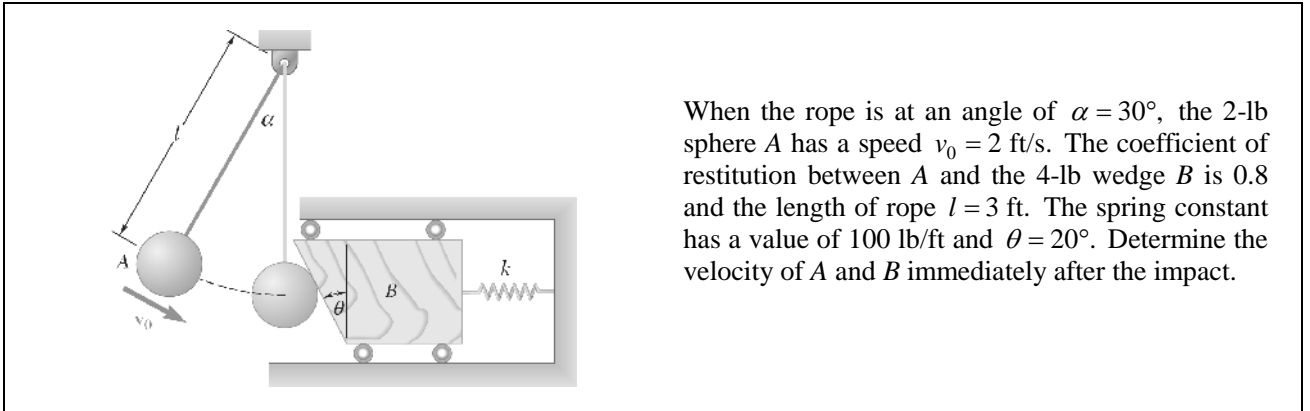
### Chapter 13, Problem 168



The diagram shows two billiard balls, A and B, on a table. A coordinate system is established with the  $x$ -axis horizontal and the  $y$ -axis vertical. Ball A is located at a horizontal distance of 6 in. from the  $y$ -axis. Ball B is located at a vertical height of 10 in. from the horizontal line passing through the center of ball A. Ball A is moving with a velocity  $v_A$  at an angle  $\theta$  to the horizontal. Ball B is initially at rest. After impact, ball B moves with a velocity  $v_B'$  in the positive  $x$  direction.

The coefficient of restitution is 0.9 between the two 2.37-in. diameter billiard balls  $A$  and  $B$ . Ball  $A$  is moving in the direction shown with a velocity of 3 ft/s when it strikes ball  $B$ , which is at rest. Knowing that after impact  $B$  is moving in the  $x$  direction, determine (a) the angle  $\theta$ , (b) the velocity of  $B$  after impact.

**Chapter 13, Problem 188**



When the rope is at an angle of  $\alpha = 30^\circ$ , the 2-lb sphere  $A$  has a speed  $v_0 = 2$  ft/s. The coefficient of restitution between  $A$  and the 4-lb wedge  $B$  is 0.8 and the length of rope  $l = 3$  ft. The spring constant has a value of 100 lb/ft and  $\theta = 20^\circ$ . Determine the velocity of  $A$  and  $B$  immediately after the impact.