Prob-Chap05-PHYS-109

5.5. A system is made up of point masses P_1 at position (–1 m, 5 m, 7 m), P_2 at position (3 m, 3 m, 3 m), and P_3 at position (9 m, –5 m, –2 m). Find the centre of mass of the system if (a) each of the point masses has the same mass, and (b) m1 = 2m2 = 4m3.

5.7. A student of mass 75 kg is in a small rowboat of mass 95 kg resting on a calm lake. How far will the boat move if the student walks from the bow to the stern of the boat? The distance from the bow to the stern is 2.5 m. Ignore any horizontal force exerted by the water.

5.16. Fig. 5.21(a) shows two objects of masses m_1 and m_2 travelling with velocities $\overrightarrow{v_1}$ and $\overrightarrow{v_2}$ toward a collision point (chosen at the origin). After a perfectly inelastic collision, the combined object travels with angle f relative to the positive x-axis, as indicated in Fig. 5.21(b).
(a) Derive the x- and y-component formulas for the velocity of the combined object after the collision.

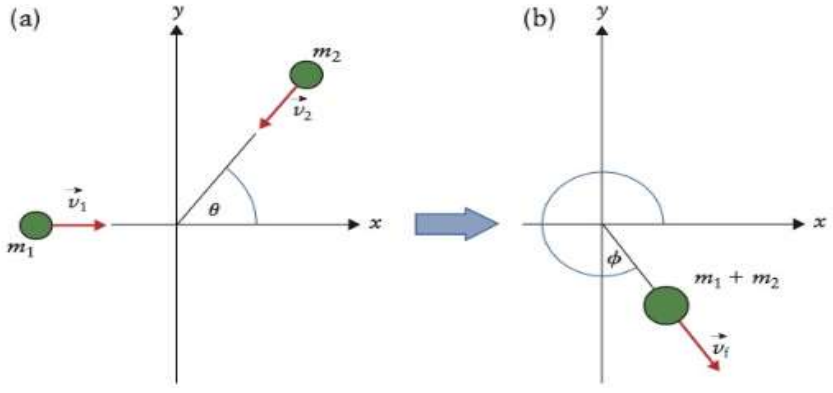

Figure 5.21 Perfectly inelastic collision of two moving objects in the *xy*-plane.

5.20. An object of mass m = 3.0 kg makes a perfectly inelastic collision with a second object that is initially at rest. The combined object moves after the collision with a speed equal to one-third of the object that was initially moving. What is the mass of the object that was initially at rest?

5.21. An object of mass m = 8.0 g is fired into a larger object of mass M = 250 g that was initially at rest at the edge of a table. The smaller object becomes embedded in the larger object, and the combined object lands on the floor a distance of 2.0 m away from the table. If the tabletop is 1.0 m above the floor, determine the initial speed of the smaller object.