Chapter 9

0 kg object moving on a frictionless surface with speed v explodes into two pieces of es 1.0 kg and 3.0 kg. The 1.0 kg piece moves east at a speed of 5.0 m/s and the 3.0 kg piece s north at 3.0 m/s. What is the velocity of the 4.0 kg object before explosion?

Conservation of linear momentum

$$\vec{P}_i = \vec{P}_f$$

$$P_{xi} = P_{xf} \Rightarrow 4 v_x = 1 \times 5 + 0 = 5$$

$$v_x = \frac{5}{4} = 1.25 \text{ m/s}$$

$$P_{yi} = P_{yf} \Rightarrow 4 v_y = 3 \times 3 + 0 = 9$$

$$v_y = \frac{9}{4} = 2.25 \text{ m/s}$$

$$\vec{v} = v_x \hat{i} + v_y \hat{j} = 1.25\hat{i} + 2.25\hat{j} \text{ m/s}$$