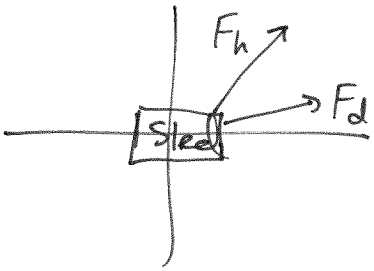
Chapter 5 Problem 104

$M = 575\ kg$

$\vec{F}_d = \{2.48\,\hat{i} + 4.33\,\hat{j}\}\ N$

$\vec{F}_h = \{6.56\,\hat{i} + 5.33\,\hat{j}\}\ N$




a) Find the net force on the sled

$$\vec{F}_{net} = \vec{F}_h + \vec{F}_d = \{6.56\,\hat{i} + 5.33\,\hat{j}\}N + \{2.48\,\hat{i} + 4.33\,\hat{j}\}N$$

$$\boxed{\vec{F}_{net} = \{9.04\,\hat{i} + 9.66\}N}$$

b) Find the acceleration of the sled.

$$\vec{F}_{net} = M\vec{a} \longrightarrow \vec{a} = \frac{\vec{F}_{net}}{M} = \frac{\{9.04\,\hat{i} + 9.66\}N}{575\ kg}$$

$$\vec{a} = \{0.0157\,\hat{i} + 0.0168\,\hat{j}\}\ m/s^2$$

Magnitude of the acceleration is

$$a = \sqrt{(0.0157)^2 + (0.0168)^2}\ m/s^2$$

$$\boxed{a = 0.0230\ m/s^2}$$

c) Find the velocity after 6.50 s,

Assume the initial velocity is zero. Then from the 3rd Kinematic equation

$$X = X_0 + v_0 t + \tfrac{1}{2} a t^2$$

$$= 0 + 0 + \tfrac{1}{2}\left(0.0230\ \tfrac{m}{s^2}\right)(6.50\ s)^2 = 0.486\ m$$

The velocity will be

$$v = v_0 + at = 0 + (0.0230\ m/s^2)(6.50\ s) = 0.1495\ \tfrac{m}{s}$$

$$\boxed{v = 0.150\ m/s}$$