Problem 5.3

a.) To use Newton's Second Law (F=ma), we need to determine the acceleration. Using kinematics to do so yields:

$$a_x = \frac{\Delta v_x}{\Delta t} = \frac{(v_f - v_o)_x}{\Delta t} = \frac{((8.00\text{ m/s}) - (3.00\text{ m/s}))}{(8.00\text{ s})} = .625\text{ m/s}^2$$

and

$$a_y = \frac{\Delta v_y}{\Delta t} = \frac{(v_f - v_o)_y}{\Delta t} = \frac{((10.0\text{ m/s}) - (0\text{ m/s}))}{(8.00\text{ s})} = 1.25\text{ m/s}^2$$

With the acceleration components, we can write the force components as:

$$F_x = ma_x = (4.00\text{ kg})(.625\text{ m/s}^2) = 2.50\text{ N}$$

and

$$F_y = ma_y = (4.00\text{ kg})(1.25\text{ m/s}^2) = 5.00\text{ N}$$

So the net force will be:

$$\vec{F} = F_x\hat{i} + F_y\hat{j} = (2.50\text{ N})\hat{i} + (5.00\text{ N})\hat{j}$$

b.) As for the magnitude of the force:

$$|\vec{F}| = \sqrt{(F_x)^2 + (F_y)^2} = \sqrt{(2.50\text{ N})^2 + (5.00\text{ N})^2} = 5.59\text{ N}$$