

Chapter 5 Problem 14 †

Given

$$m = 3.1 \text{ kg}$$

$$\vec{a} = \{0.91 \hat{i} - 0.27 \hat{j}\} \text{ m/s}^2$$

$$\vec{F}_1 = \{-1.2 \hat{i} - 2.5 \hat{j}\} \text{ N}$$

Solution

Find the second force given the first force and overall acceleration.

From Newton's 2nd law

$$\vec{F} = m\vec{a}$$

Since there are two forces present, then

$$\vec{F}_1 + \vec{F}_2 = m\vec{a}$$

Solve for \vec{F}_2

$$\vec{F}_2 = m\vec{a} - \vec{F}_1$$

Substitute in the provided values gives

$$\vec{F}_2 = (3.1 \text{ kg})\{0.91 \hat{i} - 0.27 \hat{j}\} \text{ m/s}^2 - \{-1.2 \hat{i} - 2.5 \hat{j}\} \text{ N}$$

Simplify

$$\vec{F}_2 = \{2.82 \hat{i} - 0.837 \hat{j}\} \text{ N} + \{1.2 \hat{i} + 2.5 \hat{j}\} \text{ N}$$

$$\vec{F}_2 = \{4.02 \hat{i} + 1.663 \hat{j}\} \text{ N}$$

Write to 2 significant digits

$$\vec{F}_2 = \{4.0 \hat{i} + 1.7 \hat{j}\} \text{ N}$$

†Problem from Essential University Physics, Wolfson