Chapter 5 Problem 13 [†]

Given
$m = 3.1\ kg$
$\vec{a} = \{0.91\ \hat{i} - 0.27\ \hat{j}\}\ m/s^2$
$\vec{F}_1 = \{-1.2\ \hat{i} - 2.5\ \hat{j}\}\ N$

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

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

Simplify

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

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

Write to 2 significant digits

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

[†]Problem from Essential University Physics, Wolfson