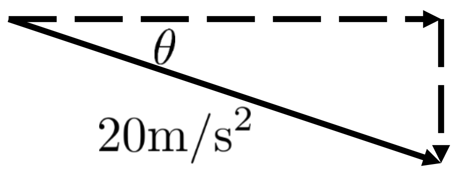
Whiteboard Problem 3.1

Find each vector's x- and y-components

(A) $\vec{v} = (10.\ \mathrm{m/s},\ \text{negative y-direction})$ $\vec{v_x} = 0.0\ \mathrm{m/s}\ \&\ \vec{v_y} = -10.\ \mathrm{m/s}$

(B) $\vec{a} = (20.\ \mathrm{m/s^2},\ 30^\circ\ \text{below positive x-axis})$



$$sin(\theta) = \frac{a_y}{20\mathrm{m/s^2}}$$

$$cos(\theta) = \frac{a_x}{20\mathrm{m/s^2}}$$

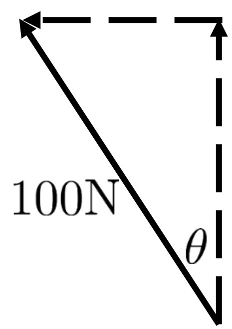
$$\vec{a_x} = 17.\mathrm{m/s^2}\ \&\ \vec{a_y} = -10.\mathrm{m/s^2}$$

(C) $\vec{F} = (100.\ \mathrm{N},\ 126.9^\circ\ )$

$$sin(\theta) = \frac{F_x}{100\mathrm{N}}$$

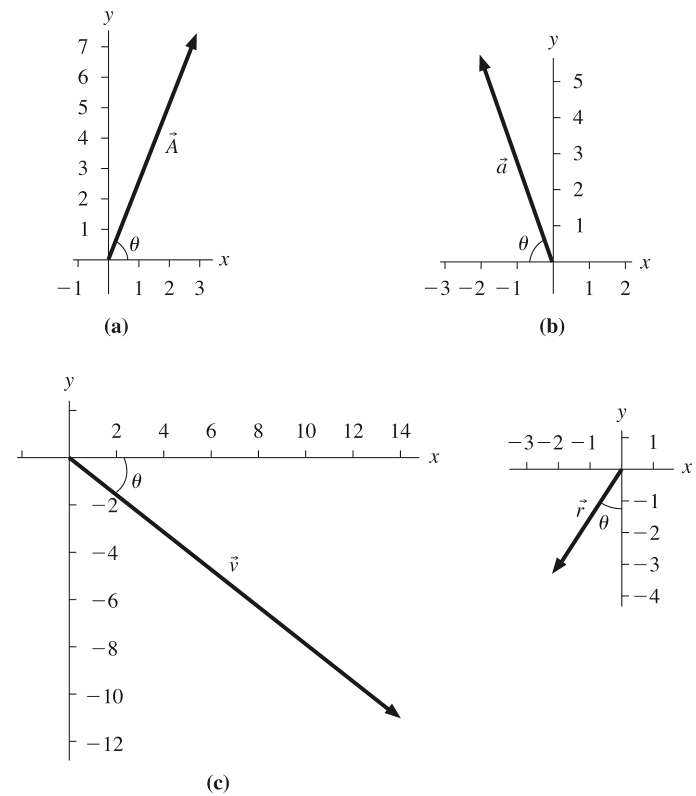
$$cos(\theta) = \frac{F_y}{100\mathrm{N}}$$

$$\vec{F_x} = -60.\mathrm{N}\ \&\ \vec{F_y} = 80.\mathrm{N}$$



Whiteboard problem 3.2: Chapter 3, Problem # 11

3.11 Visualize:



Solve: (a)

$$A=\sqrt{(3.0)^2+(7.0)^2}=7.6, \quad \theta=67°$$

b)

$$a=\sqrt{(-2.0\ \text{m/s}^2)^2+(4.5\ \text{m/s}^2)^2}=4.9\ \text{m/s}^2, \quad \theta=66°$$

c)

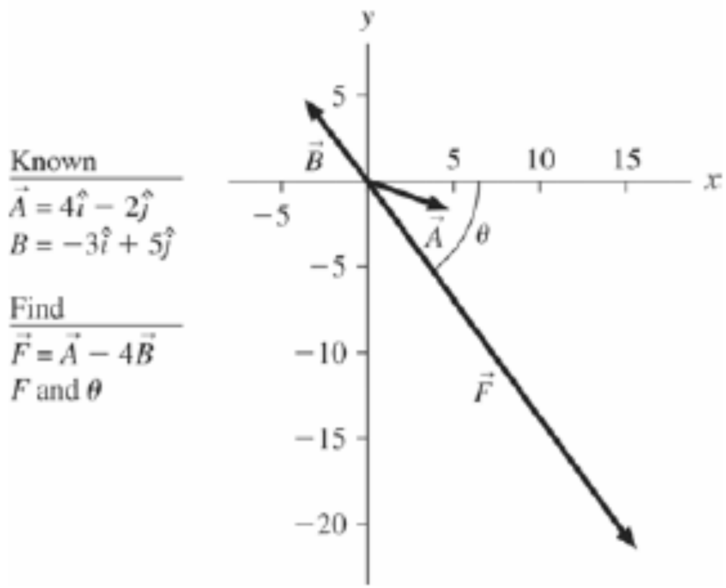
$$v=\sqrt{(14\ \text{m/s})^2+(-11\ \text{m/s})^2}=18\ \text{m/s}, \quad \theta=38°$$

d)

$$r=\sqrt{(-2.2\ \text{m})^2+(-3.3\ \text{m})^2}=4.0\ \text{m}, \quad \theta=34°$$

Whiteboard Problem 3.3: Ch 3, # 16

3.16. Visualize:



Solve: **(a)** We have $\vec{A} = 4\hat{i} - 2\hat{j}$ and $\vec{B} = -3\hat{i} + 5\hat{j}$. This means $4\vec{B} = -12\hat{i} + 20\hat{j}$. Hence, $\vec{F} = \vec{A} - 4\vec{B} = [4-(-12)]\hat{i} + [-2-20]\hat{j} = 16\hat{i} - 22\hat{j} = F_x\hat{i} + F_y\hat{j}$, so $F_x = 16$ and $F_y = -22$.

(b) The vectors $\vec{A}$, $\vec{B}$, and $\vec{F}$ are shown in the above figure.

(c) The magnitude and direction of $\vec{F}$ are

$$F = \sqrt{F_x^2 + F_y^2} = \sqrt{(16)^2 + (-22)^2} = 27$$

$$\theta = \tan^{-1}\left(\left|F_y\right|/F_x\right) = \tan^{-1}(22/16) = 54°$$

Assess: $F_y > F_x$ implies $\theta > 45°$, which is consistent with the figure.