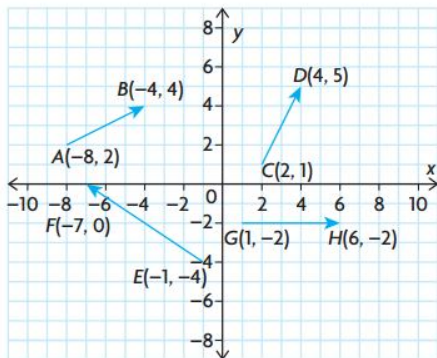


6.6 Algebraic Operations with Vectors in \mathbb{R}^2

These problems taken from the Nelson text: Pg. 324 – 326

2. Draw the vector \overrightarrow{OA} on a graph, where point A has coordinates (6, 10).
 - a. Draw the vectors $m\overrightarrow{OA}$, where $m = \frac{1}{2}, \frac{-1}{2}, 2$, and -2 .
 - b. Which of these vectors have the same magnitude?
3. For the vector $\overrightarrow{OA} = 3\vec{i} - 4\vec{j}$, calculate $|\overrightarrow{OA}|$.
4. a. If $a\vec{i} + 5\vec{j} = (-3, b)$, determine the values of a and b .
 b. Calculate $|(-3, b)|$ after finding b .
5. If $\vec{a} = (-60, 11)$ and $\vec{b} = (-40, -9)$, calculate each of the following:
 - a. $|\vec{a}|$ and $|\vec{b}|$
 - b. $|\vec{a} + \vec{b}|$ and $|\vec{a} - \vec{b}|$
6. Find a single vector equivalent to each of the following:
 - a. $2(-2, 3) + (2, 1)$
 - b. $-3(4, -9) - 9(2, 3)$
 - c. $\frac{-1}{2}(6, -2) + \frac{2}{3}(6, 15)$
7. Given $\vec{x} = 2\vec{i} - \vec{j}$ and $\vec{y} = -\vec{i} + 5\vec{j}$, find a vector equivalent to each of the following:
 - a. $3\vec{x} - \vec{y}$
 - b. $-(\vec{x} + 2\vec{y}) + 3(-\vec{x} - 3\vec{y})$
 - c. $2(\vec{x} + 3\vec{y}) - 3(\vec{y} + 5\vec{x})$
8. Using \vec{x} and \vec{y} given in question 7, determine each of the following:
 - a. $|\vec{x} + \vec{y}|$
 - b. $|\vec{x} - \vec{y}|$
 - c. $|2\vec{x} - 3\vec{y}|$
 - d. $|3\vec{y} - 2\vec{x}|$
15. A(5, 0) and B(0, 2) are points on the x- and y-axes, respectively.
 - a. Find the coordinates of point P(a, 0) on the x-axis such that $|\overrightarrow{PA}| = |\overrightarrow{PB}|$.
 - b. Find the coordinates of a point on the y-axis such that $|\overrightarrow{QB}| = |\overrightarrow{QA}|$.

9. a. For each of the vectors shown below, determine the components of the related position vector.
b. Determine the magnitude of each vector.



12. A parallelogram has three of its vertices at $A(-1, 2)$, $B(7, -2)$, and $C(2, 8)$.
- Draw a grid and locate each of these points.
 - On your grid, draw the three locations for a fourth point that would make a parallelogram with points A , B , and C .
 - Determine all possible coordinates for the point described in part b.
13. Determine the value of x and y in each of the following:
- $3(x, 1) - 5(2, 3y) = (11, 33)$
 - $-2(x, x + y) - 3(6, y) = (6, 4)$

Answers to Selected Problems

- | | | |
|---|--|---|
| 3. 5 | 7. a. $7\vec{i} - 8\vec{j}$ | 13. a. $x = 7, y = -2$ |
| 4. a. $a = -3, b = 5$ | b. $3\vec{i} - 51\vec{j}$ | b. $x = -12, y = 4.$ |
| b. 5.83 | c. $-29\vec{i} + 28\vec{j}$ | |
| 5. a. $ \vec{a} = 61, \vec{b} = 41$ | 8. a. about 4.12 | 15. a. $P\left(\frac{21}{10}, 0\right)$ |
| b. $ \vec{a} + \vec{b} \doteq 100.02,$ | b. about 6.71 | b. $Q\left(0, -\frac{21}{4}\right)$ |
| $ \vec{a} - \vec{b} \doteq 28.28$ | c. about 18.38 | |
| 6. a. $(-2, 7)$ | d. about 18.38 | |
| b. $(-30, 0)$ | 9. a. $\overrightarrow{AB} = (4, 2), \overrightarrow{CD} = (2, 4),$ | |
| c. $(1, 11)$ | $\overrightarrow{EF} = (-6, 4), \overrightarrow{GH} = (5, 0)$ | |
| | b. $ \overrightarrow{AB} \doteq 4.47, \overrightarrow{CD} \doteq 4.47,$ | |
| | $ \overrightarrow{EF} \doteq 7.21, \overrightarrow{GH} = 5$ | |