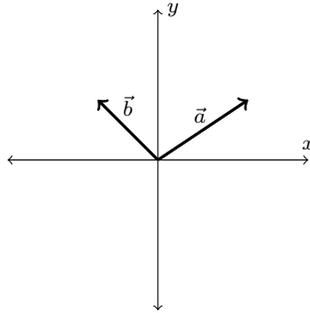


Math 8
Vectors in 2-Space and 3-Space

Practice Problems

1) Given the vectors \vec{a} and \vec{b}



sketch in 2-Space the following vectors.

a) $\vec{a} + \vec{b}$

b) $\vec{a} - \vec{b}$

c) $-\vec{a} + 2\vec{b}$

2) Let $\vec{a} = \langle 5, -12, 1 \rangle$ and $\vec{b} = \langle -1, 2, 8 \rangle$. Find the following

a) $\vec{a} + \vec{b}$

c) $3\vec{a} - 2\vec{b}$

b) $|\vec{a} + \vec{b}|$

d) $|3\vec{a} - 2\vec{b}|$

3) Let $\vec{a} = \langle 1, \sqrt{3}, 0 \rangle$

a) What is the angle between \vec{a} and the x -axis?

b) What is the angle between \vec{a} and the vector $\langle 0, 0, 1 \rangle$?

4) A person walks due west on the deck of a ship at 3 mi/h. The ship is moving north at a speed of 22 mi/h. Find the speed and direction of the woman relative to the surface of the water.

Problems to Turn In

1) Let $\vec{r} = \langle x, y, z \rangle$ and $\vec{c} = \langle 3, -1, 6 \rangle$. Give an equation for the set of points (x, y, z) where $|\vec{r} - \vec{c}| = 1$. What does this equation describe?

2) Let $A = (1, 1, 1)$, $B = (3, 2, 1)$ and $C = (2, 2, 4)$. Show that

$$\vec{AB} + \vec{BC} + \vec{CA} = 0.$$

In fact, this will be the case for any points A , B , and C . Explain, in words or with a picture why this must be true.

3) Let $\vec{a} = \langle a_1, a_2, a_3 \rangle$ and $\vec{b} = \langle b_1, b_2, b_3 \rangle$ be vectors such that

$$|\vec{a} - \vec{b}| = |\vec{a} + \vec{b}|.$$

a) What can you conclude about the parallelogram generated by \vec{a} and \vec{b} ? What must the angle be between these two vectors?

b) We will define in class the **dot product** of two vectors \vec{a} and \vec{b} as

$$\vec{a} \cdot \vec{b} = a_1b_1 + a_2b_2 + a_3b_3,$$

and show that this quantity is very useful when studying vectors. For now show that $\vec{a} \cdot \vec{b} = 0$ assuming $|\vec{a} - \vec{b}| = |\vec{a} + \vec{b}|$.