Pre-Calculus Review
Section 9.6 Vectors

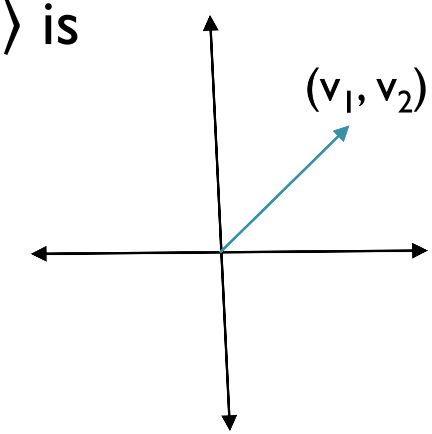
- Quantities such as force, displacement or velocity have direction and magnitude. These quantities can be represented by **directed line segments**.
- $\overrightarrow{PQ}$ starts at the initial point P and ends at the terminal point Q. Length or magnitude is denoted $\left|\overrightarrow{PQ}\right|$.
- A **vector** in a plane is represented by a directed line segment. Textbooks use lowercase, boldface letters.
- **Equal vectors** have the same length and direction (same slope).

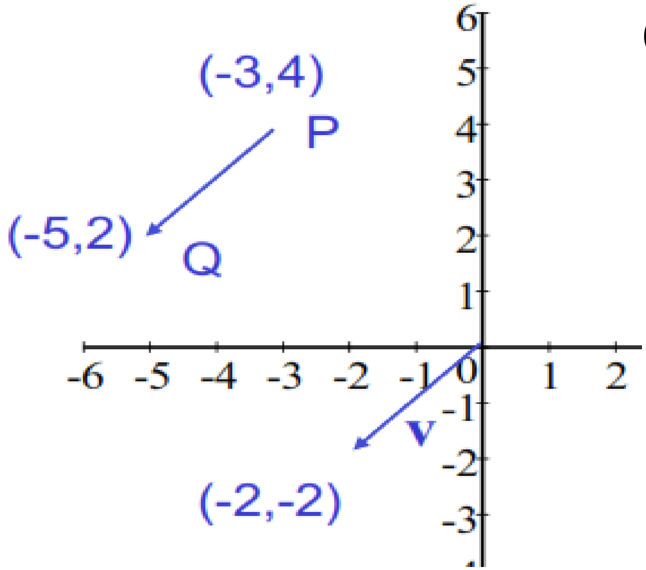
- A vector is in **standard position** if the initial point is at the origin.

The **component form** of this vector is $\vec{v} = \langle v_1, v_2 \rangle$

The **magnitude** (length) of $\vec{v} = \langle v_1, v_2 \rangle$ is

$$|\vec{v}| = \sqrt{{v_1}^2 + {v_2}^2}$$





Order matters!

Terminal Point – Initial Point

The component form of $\overrightarrow{PQ}$ is

$|\overrightarrow{PQ}|$=

$|\vec{v}|$=

Slope of $\overrightarrow{PQ}$=

Slope of $\vec{v}$=

Both vectors have the same direction because the both are directed towards the lower left and have the same slope.

Because both vectors have the same length and direction, they are equivalent. $\overrightarrow{PQ} = \vec{v}$

If $|\vec{u}| = 1,$ then $\vec{u}$ is a unit vector.

$\langle 0{,}0 \rangle$ is the zero vector. It has no direction.

In some applications of vectors, it is useful to find a unit vector that has the same direction as a given vector.

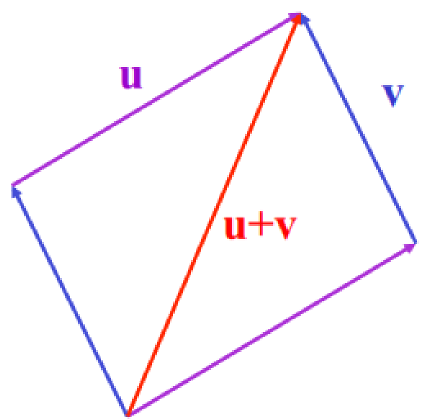
If $\vec{v}$ is a nonzero vector, then the vector $\vec{u} = \frac{\vec{v}}{|\vec{v}|}$ is a unit vector in the direction of v.

Vector Operations

Let $\mathbf{u} = \langle u_1, u_2 \rangle$, $\mathbf{v} = \langle v_1, v_2 \rangle$, k is a scalar (real number).

$$\mathbf{u} + \mathbf{v} = \langle u_1, u_2 \rangle + \langle v_1, v_2 \rangle = \langle u_1 + v_1, u_2 + v_2 \rangle$$

(Add the components.)



u + v is the resultant vector.

(Parallelogram law of addition)

$$\mathbf{u} - \mathbf{v} = \langle u_1, u_2 \rangle - \langle v_1, v_2 \rangle = \langle u_1 - v_1, u_2 - v_2 \rangle$$

(Subtract the components.)

Scalar Multiplication: $k\mathbf{u} = \langle ku_1, ku_2 \rangle$

Negative (opposite): $-\mathbf{u} = (-1)\mathbf{u} = \langle -u_1, -u_2 \rangle$

Example Problem

Let $\mathbf{u} = \langle -1, 3 \rangle$ and $\mathbf{v} = \langle 4, 7 \rangle$.

Find the (a)component form and (b) magnitude of the the following:

$$2\mathbf{u} + 3\mathbf{v}$$

Find slope of vector:

Homework

- P. 684 #5, 7-13 odd part b only, 17-21 odd, 25, 35,37