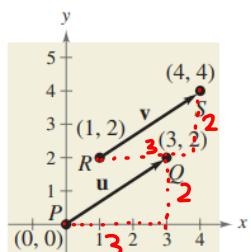
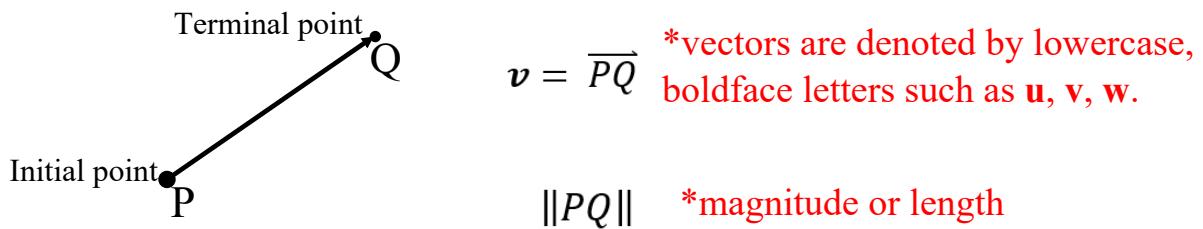


## Section 6.3A Vectors in the Plane

Vector: magnitude and direction

Show that  $\mathbf{u}$  and  $\mathbf{v}$  are equivalent

$$\|\mathbf{u}\| = \sqrt{3^2 + 2^2} = \sqrt{13} \quad \overrightarrow{RS} = \frac{2}{3} = \langle 3, 2 \rangle$$

$$\|\mathbf{v}\| = \sqrt{3^2 + 2^2} = \sqrt{13} \quad \overrightarrow{PQ} = \frac{2}{3} = \langle 3, 2 \rangle$$

## Component Form of a Vector

The component form of the vector with the initial point  $P(p_1, p_2)$  and terminal point  $Q(q_1, q_2)$  is given by

$$\overrightarrow{PQ} = \langle q_1 - p_1, q_2 - p_2 \rangle = \langle v_1, v_2 \rangle = \mathbf{v}.$$

Component form

The **magnitude** (or length) of  $\mathbf{v}$  is given by

$$\|\mathbf{v}\| = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2} = \sqrt{v_1^2 + v_2^2}$$

If  $\|\mathbf{v}\| = 1$ , then  $\mathbf{v}$  is a **unit vector**. Moreover,  $\|\mathbf{v}\| = 0$  if and only if  $\mathbf{v}$  is the zero vector  $\mathbf{0}$

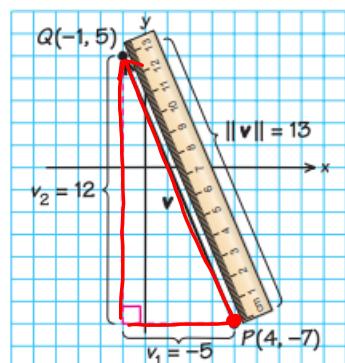
zero vector is when the initial point and terminal point lie at the origin.

Find the component form and magnitude of the vector  $\mathbf{v}$  that has initial point  $(4, -7)$  and terminal point  $(-1, 5)$

$$\mathbf{v} = \langle -5, 12 \rangle$$

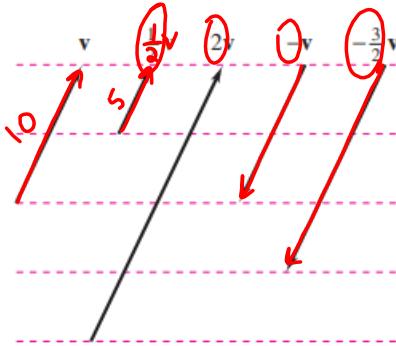
component form

$$\|\mathbf{v}\| = 13$$

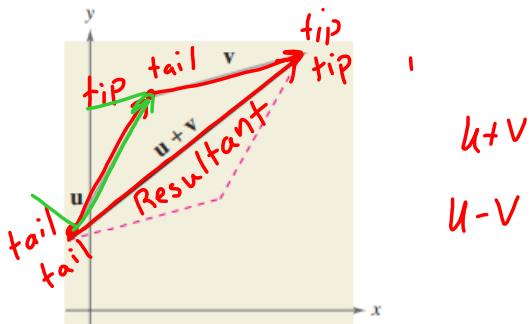


## Vector Operations

\*scalar multiplication



\*vector addition



Let  $\mathbf{v} = \langle -2, 5 \rangle$  and  $\mathbf{w} = \langle 3, 4 \rangle$  Find each vector algebraically.

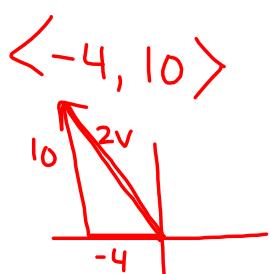
a)  $2\mathbf{v}$

$2\langle -2, 5 \rangle$

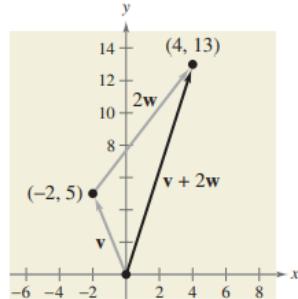
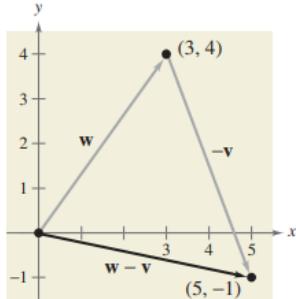
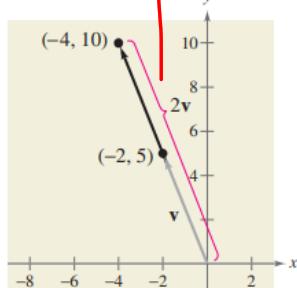
b)  $\mathbf{w} - \mathbf{v}$

$\langle 3, 4 \rangle - \langle -2, 5 \rangle$

c)  $\mathbf{v} + 2\mathbf{w}$



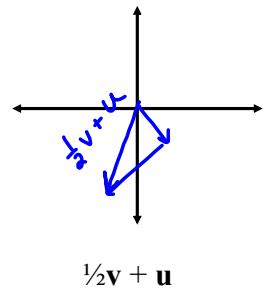
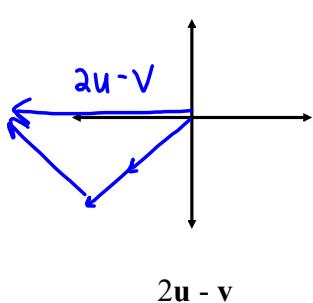
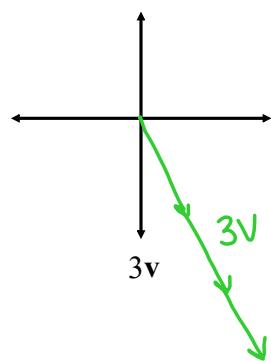
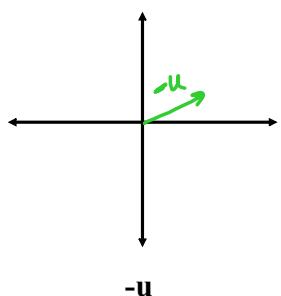
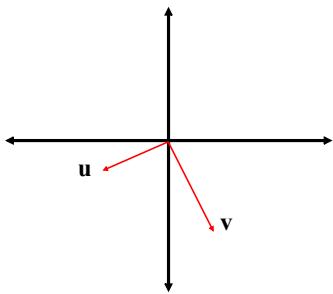
$\langle 5, -1 \rangle$



Pull

## Precalc 6.3A Vectors in the plane.notebook

Use the given figure to sketch a graph of the specified vector.

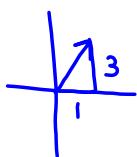


### Finding the magnitude of a Scalar Multiple

Let  $\mathbf{u} = \langle 1, 3 \rangle$  and  $\mathbf{v} = \langle -2, 5 \rangle$

a)  $\|2\mathbf{u}\|$

$$2\|\mathbf{u}\| = 2\sqrt{10}$$



b)  $\|5\mathbf{u}\|$

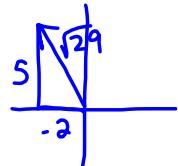
$$5\|\mathbf{u}\|$$

$$5\sqrt{10}$$

c)  $\|3\mathbf{v}\|$

$$3\|\mathbf{v}\|$$

$$3\sqrt{29}$$

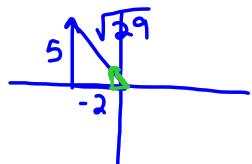


Finding a unit vector

$$\mathbf{u} = \text{unit vector} = \frac{\mathbf{v}}{\|\mathbf{v}\|}$$

Unit vector has a magnitude of 1

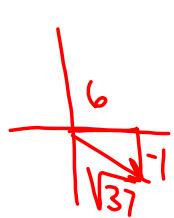
Find a unit vector  $\mathbf{u}$  in the direction of  $\mathbf{v} = \langle -2, 5 \rangle$ .



$$\mathbf{u} = \left\langle \frac{-2}{\sqrt{29}}, \frac{5}{\sqrt{29}} \right\rangle$$

$$\left(\frac{-2}{\sqrt{29}}\right)^2 + \left(\frac{5}{\sqrt{29}}\right)^2 = 1$$

Find a unit vector  $\mathbf{u}$  in the direction of  $\mathbf{v} = \langle 6, -1 \rangle$ .



$$\mathbf{u} = \left\langle \frac{6}{\sqrt{37}}, \frac{-1}{\sqrt{37}} \right\rangle$$

$$\frac{36}{37} + \frac{1}{37} = 1$$

$$\frac{37}{37} = 1$$

Find the vector  $\mathbf{v}$  with the given magnitude and the same direction as  $\mathbf{u}$ .

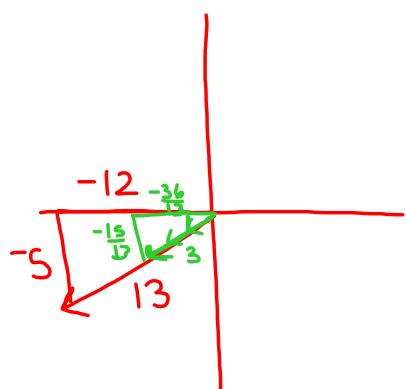
$$\|\mathbf{v}\| = 3 \quad \mathbf{u} = \langle -12, -5 \rangle \quad (\text{magnitude of } \mathbf{v})(\text{unit vector of } \mathbf{u})$$

$$\text{unit vector } \left\langle \frac{-12}{13}, \frac{-5}{13} \right\rangle$$

$$3 \left\langle \frac{-12}{13}, \frac{-5}{13} \right\rangle$$

$$\left\langle \frac{-36}{13}, \frac{-15}{13} \right\rangle$$

$$\langle -2.7, -1.2 \rangle$$



Precalc 6.3A Vectors in the plane.notebook

Section 6.3A Pgs. 425-428

#9-13 odd, 14-18, 19-23 odd, 25-30, 31-50 odd