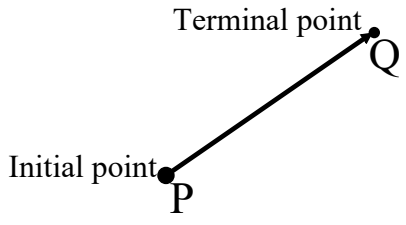
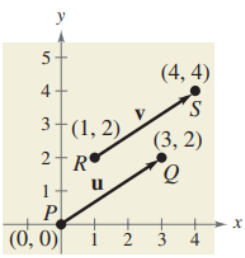
Section 6.3A Vectors in the Plane

Vector: magnitude and direction



$\boldsymbol{v} = \overrightarrow{PQ}$ *vectors are denoted by lowercase, boldface letters such as **u**, **v**, **w**.

$\|PQ\|$ *magnitude or length



Show that **u** and **v** are equivalent

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

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

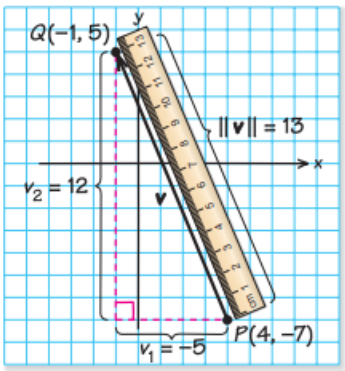
The **magnitude** (or length) of **v** is given by

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

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

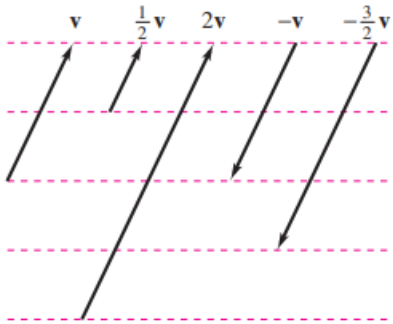
zero vector is when the initial point and terminal point lie at the origin.

Find the component form and magnitude of the vector **v** that has initial point (4, -7) and terminal point (-1, 5)

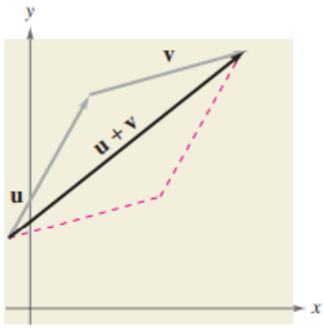


Vector Operations

*scalar multiplication



*vector addition

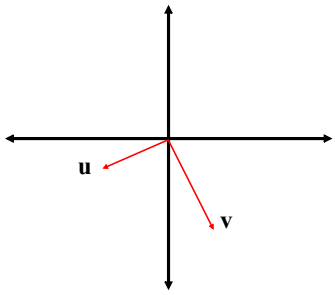


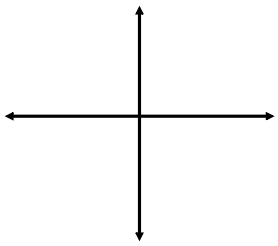
Let **v** = ⟨-2, 5⟩ and **w** = ⟨3, 4⟩ Find each vector algebraically.

a) 2**v** b) **w** - **v** c) **v** + 2**w**

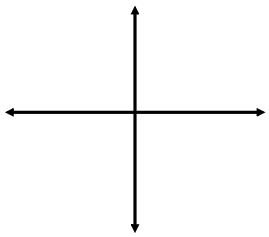
Pull

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

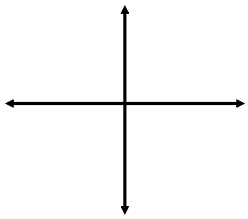




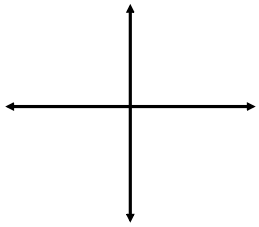
-u



3**v**



2**u** - **v**



½**v** + **u**

Finding the magnitude of a Scalar Multiple

Let **u** = $\langle 1, 3 \rangle$ and **v** = $\langle -2, 5 \rangle$

a) $\|2\mathbf{u}\|$ b) $\|-5\mathbf{u}\|$ c) $\|3\mathbf{v}\|$

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 **u** in the direction of $\mathbf{v} = \langle -2, 5 \rangle$.

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

Find the vector **v** with the given magnitude and the same direction as **u**.

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

Section 6.3A Pgs. 425-428

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