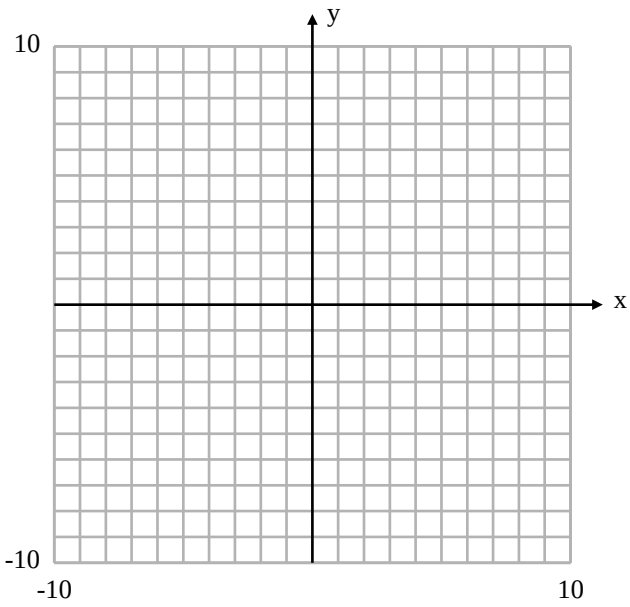
Vectors in the Plane 3-5-08

Scalar:

Vector:



Two vectors are equal

Definition Magnitude or Length

The **magnitude** or **length** of the vector $\mathbf{v} = \overrightarrow{PQ}$ determined by $P(x_1, y_1)$ and $Q(x_2, y_2)$ is

$$|\mathbf{v}| = \sqrt{v_1^2 + v_2^2} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

1. Let be $\vec{u}$ the vector represented by the directed line segment $\overrightarrow{RS}$ and $\vec{v}$ be the vector represented by the directed line segment $\overrightarrow{OP}$. Prove that $\vec{u} = \vec{v}$.
   $R = (-2,-1)$, $S = (2,4)$, $O = (-3,-1)$, $P = (1,4)$

Vectors in the Plane 3-5-08

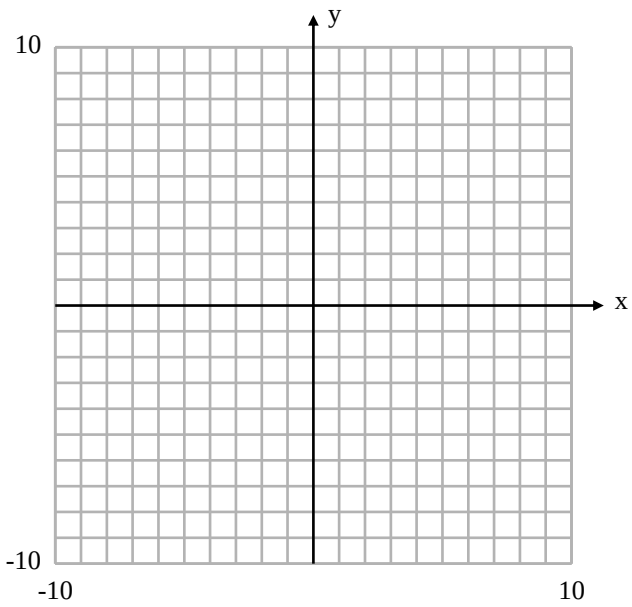
Definition Component Form of a Vector

If **v** is a vector in the plane equal to the vector with initial point (0, 0) and terminal point (v_1, v_2), then the **component form** of **v** is

$$\mathbf{v} = \langle v_1, v_2 \rangle.$$

2. Let $P = (-2, 2)$, *and* $S = (2, -8)$. Find the component form and magnitude of the vector.

$\overrightarrow{PS}$



Vectors in the Plane 3-5-08

Definition Vector Addition and Scalar Multiplication

Let $\mathbf{u} = \langle u_1, u_2 \rangle$ and $\mathbf{v} = \langle v_1, v_2 \rangle$ be vectors and k a real number (scalar). Then the **sum of vectors u and v** is the vector

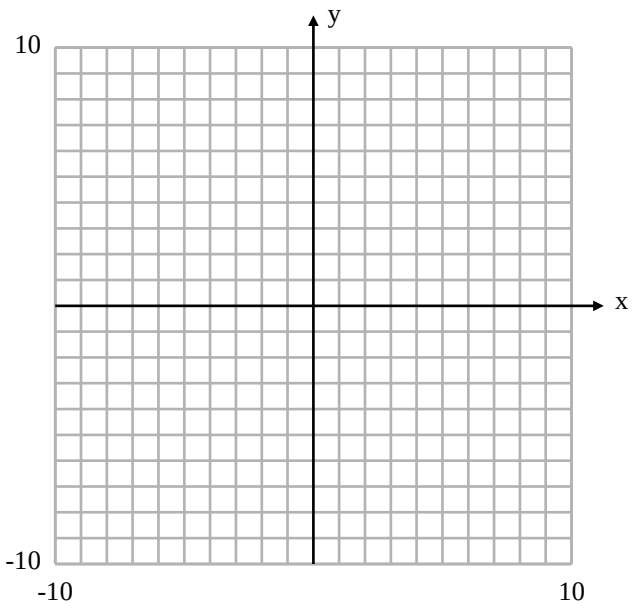
$$\mathbf{u} + \mathbf{v} = \langle u_1, u_2 \rangle + \langle v_1, v_2 \rangle = \langle u_1 + v_1, u_2 + v_2 \rangle.$$

The **product of the scalar k and the vector u** is

$$k\mathbf{u} = k\langle u_1, u_2 \rangle = \langle ku_1, ku_2 \rangle.$$

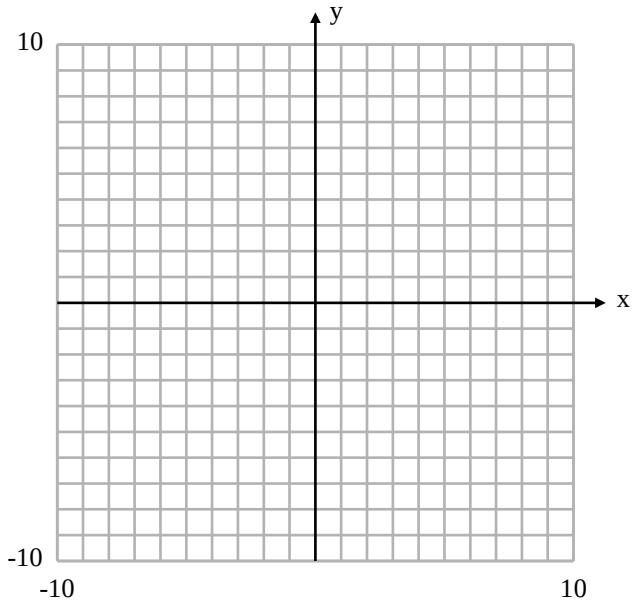
3. Let $P = (-2, 2)$, $Q = (3, 4)$, and $S = (2, -8)$. Find the component form and magnitude of the vector.

$$\overrightarrow{PS} - 3\overrightarrow{PQ}$$



4. Let $\vec{u} = \langle -4, -1 \rangle$ and $\vec{v} = \langle 2, -5 \rangle$. Find the component form of the vector.

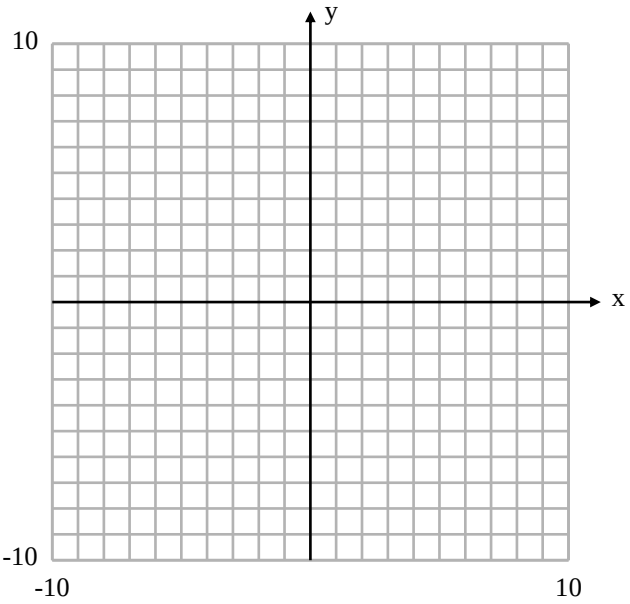
$$3\vec{v} + \vec{u}$$



Vectors in the Plane 3-5-08

5. Let $\vec{u} = \langle -1, 3 \rangle$ and $\vec{w} = \langle 2, -5 \rangle$. Find the component form of the vector.

$$2\vec{u} - \vec{w}$$



6. Find a unit vector in the direction of the following vector.

$$\vec{w} = \langle 3, -7 \rangle \qquad \vec{u} = 3\hat{i} - 5\hat{j}$$

7. Find the unit vector in the direction of the following vector in
   a. component form
   b. standard unit form

$$\vec{u} = \langle 3, -4 \rangle$$