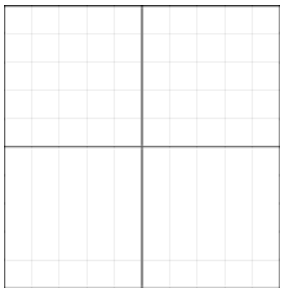
Vectors in the Plane

Vector: A directed line segment that has a magnitude and a direction.



Initial Point: $P(1,2)$

Terminal Point: $Q(-5,-2)$

Component Form of a Vector: $\mathrm{v} = \langle x_2 - x_1, y_2 - y_1 \rangle$

Linear Combination of Vectors/Standard Unit Form of a Vector: $\mathrm{v} = x\mathrm{i} + y\mathrm{j}$

Magnitude of a vector v: $\|\mathrm{v}\| = \sqrt{x^2 + y^2}$

1. Let $\mathrm{u} = \langle -3, 6 \rangle$ and $\mathrm{v} = \langle 5, -7 \rangle$. Find each of the following vector operations.

a) 2v

b) 3u – 4v

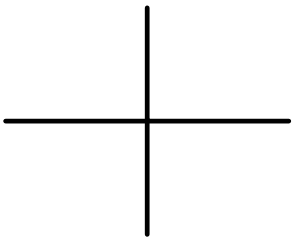
2. Find a unit vector in the direction of $v = \langle -3, 2 \rangle$.

unit vector = $\dfrac{v}{\|v\|}$

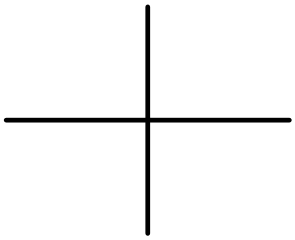
3. Find the direction angle of each vector.

Direction Angle: $\tan\theta = \dfrac{y}{x}$

a) u = 4i + 4j

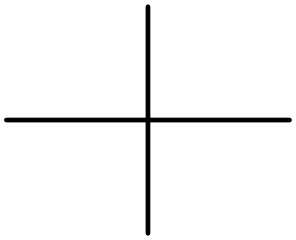


b) $v = -5i + 2j$



4. Find the vector v with a magnitude of 5 in the same direction as $u = 6i - 4j$.

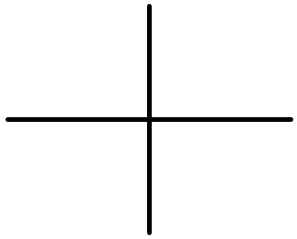
$v = \|v\|\cos\theta i + \|v\|\sin\theta j$



5. Find the magnitude and direction angle of vector v.

a) $v = 4\left(\cos 225^\circ i + \sin 225^\circ j\right)$

b) $v = -3i + 4j$



6. Use the law of cosines to find the angle between the given vectors.

$u = 3i - 4j$

$v = 5i + 2j$