Entry #: 45

Lesson 9.4: Vector Definitions

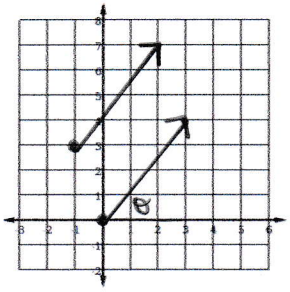
Vectors

Vector	a quantity with both magnitude and direction.
Magnitude	the length of a vector. We may apply the pythagorean theorem to the components to find the vector's length. $\|\|v\|\|$ ← magnitude of the vector
Direction	the direction of a vector is from its tail to its head.
Equivalent Vectors	vectors that have the same magnitude and the same direction. Equal vectors may have different starting points, but are always parallel
Component Form	$\langle a, b \rangle$ where a is the horizontal distance and b is the vertical distance to get to the terminal point.

Examples:

1. The initial point of a vector is $(-1,3)$ and its terminal point is $(2,7)$.

   a. Graph the vector:



   b. Graph the vector in standard position on the same set of axes.

   c. Give the component form of the vector. $\langle 3, 4 \rangle$

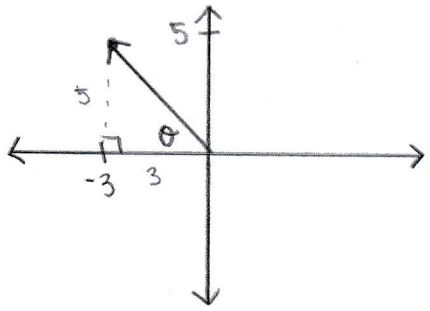
   d. Find the magnitude of the vector. $\|v\| = \sqrt{3^2+4^2} = \sqrt{9+16} = \sqrt{25} = 5$

   e. Find the direction of the vector.

$\tan(\theta) = \frac{4}{3}$

$\tan^{-1}\left(\frac{4}{3}\right) \approx 53.130°$ About $53.130°$ NE

2. Find the direction of a vector given by $\langle -3,5 \rangle$.



$\tan(\theta) = \frac{5}{3}$

$\tan^{-1}\left(\frac{5}{3}\right) \approx 59.036°$

About 59.036° NW.

3. If the magnitude of a vector v is $\|v\| = 6$ and its direction is $\theta = \frac{2\pi}{3}$, write the vector in component form.

$x = \|v\| \cos\left(\frac{2\pi}{3}\right)$

$x = 6\cos\left(\frac{2\pi}{3}\right)$

$x = 6\left(-\frac{1}{2}\right)$

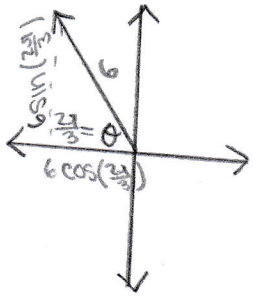
$x = -3$

$y = \|v\| \sin\left(\frac{2\pi}{3}\right)$

$y = 6\sin\left(\frac{2\pi}{3}\right)$

$y = 6\left(\frac{\sqrt{3}}{2}\right)$

$y = 3\sqrt{3}$



$\langle -3, 3\sqrt{3} \rangle$