

1. Find the component form and magnitude of the vector \mathbf{v} that has initial point $(3, -5)$ and terminal point $(-4, 2)$. $\langle -4-3, 2-(-5) \rangle$

component form $\langle -7, 7 \rangle$

magnitude $7\sqrt{2} \approx 9.899$

$$\sqrt{(-7)^2 + (7)^2} = \sqrt{98} = 7\sqrt{2}$$

2. Let $\mathbf{v} = \langle -3, 6 \rangle$ and $\mathbf{w} = \langle 2, -5 \rangle$, and find each of the following vectors.

a) $2\mathbf{v}$

$$2\langle -3, 6 \rangle = \langle -6, 12 \rangle$$

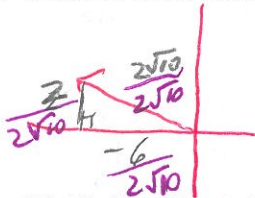
b) $2\mathbf{w} - \mathbf{v}$

$$2\langle 2, -5 \rangle - \langle -3, 6 \rangle$$

$$\langle 4, -10 \rangle + \langle 3, -6 \rangle$$

$$\langle 7, -16 \rangle$$

3. Find a unit vector in the direction of $\mathbf{v} = \langle -6, 2 \rangle$.



$$\sqrt{(-6)^2 + (2)^2} = \sqrt{40} = 2\sqrt{10}$$

$$\left\langle \frac{-6}{2\sqrt{10}}, \frac{2}{2\sqrt{10}} \right\rangle = \left\langle \frac{-3}{\sqrt{10}}, \frac{1}{\sqrt{10}} \right\rangle$$

$$\left\langle \frac{-3\sqrt{10}}{10}, \frac{\sqrt{10}}{10} \right\rangle$$

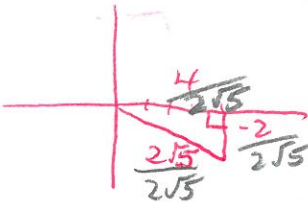
4. Find the direction angle of $\mathbf{v} = -4\mathbf{i} + 6\mathbf{j}$ to the nearest thousandth of a degree.

$$\tan \theta = \frac{6}{-4}$$

$$\theta = \tan^{-1}\left(\frac{6}{-4}\right) + 180^\circ \text{ (b/c } x < 0)$$

$$\theta = 123.690^\circ$$

5. Find the vector \mathbf{v} with $\|\mathbf{v}\| = 8$ and in the same direction as $\langle 4, -2 \rangle$.



$$\sqrt{(4)^2 + (-2)^2}$$

$$\sqrt{20}$$

$$2\sqrt{5}$$

UNIT VECTOR is

$$\left\langle \frac{2}{\sqrt{5}}, \frac{-1}{\sqrt{5}} \right\rangle$$

NOW SCALAR MULTIPLICATION

$$8 \left\langle \frac{2}{\sqrt{5}}, \frac{-1}{\sqrt{5}} \right\rangle = \left\langle \frac{16}{\sqrt{5}}, \frac{-8}{\sqrt{5}} \right\rangle$$

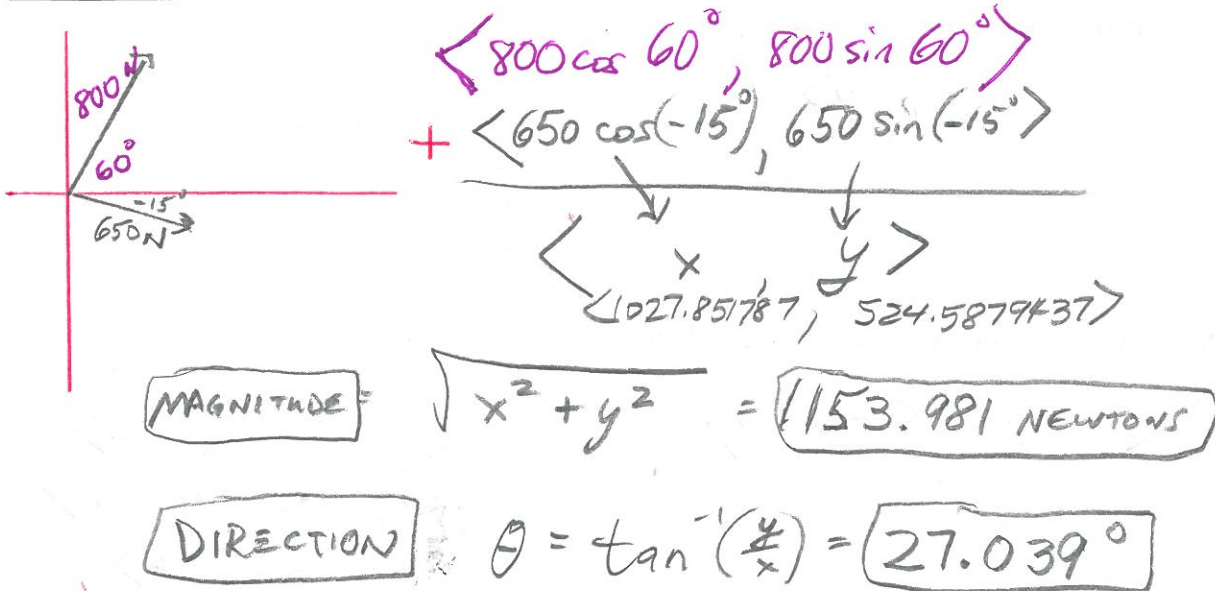
$$\left\langle \frac{16\sqrt{5}}{5}, \frac{-8\sqrt{5}}{5} \right\rangle$$

6. Find the component form of the vector that represents a ball thrown with an initial velocity of 150 feet per second, at an angle of 70° with the horizontal.

$$\langle 150 \cos 70^\circ, 150 \sin 70^\circ \rangle$$

$$\text{OR } \langle 51.303, 140.954 \rangle$$

7. Forces with magnitudes of 800 newtons and 650 newtons act on a machine part at angles of 60° and -15° , respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces. Round both answers to the nearest thousandth.



8. An airplane is traveling at a speed of 600 miles per hour with a bearing of 250° at a fixed altitude with a negligible wind velocity. As the airplane reaches a certain point, it encounters a wind blowing with a velocity of 80 miles per hour in the direction of $N30^\circ W$. What are the resultant speed and direction of the airplane? Round both answers to the nearest thousandth.

