

Given the following coordinates, find the components form, magnitude, and direction angle of each vector.

$$A(-4, -2) \quad B(\underline{3}, 5) \quad C(-2, 8)$$

$$x_1 \ y_1 \quad x_2 \ y_2$$

1. \overrightarrow{AB}

$$\langle 3 - (-4), 5 - (-2) \rangle$$

$$\langle 7, 7 \rangle$$

$$\begin{aligned} \text{mag} &= \sqrt{7^2 + 7^2} \\ &= \sqrt{49 + 49} \\ &= \sqrt{98} \end{aligned}$$

$$\tan^{-1}\left(\frac{7}{7}\right) = 45^\circ$$

2. \overrightarrow{BC}

$$\langle -2 - 3, 8 - 5 \rangle$$

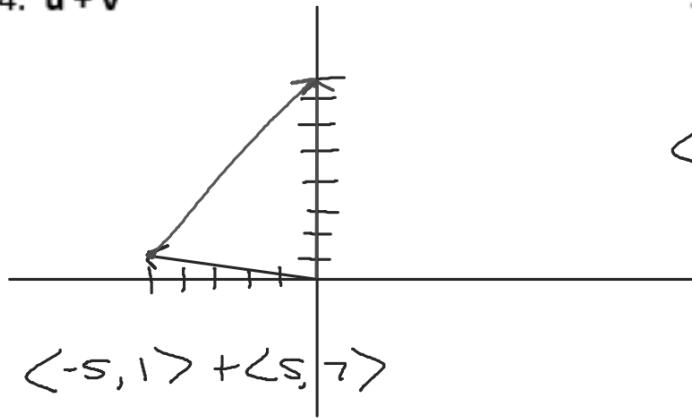
$$\langle -5, 3 \rangle$$

$$\begin{aligned} \text{mag} &= \sqrt{(-5)^2 + (3)^2} \\ &= \sqrt{25 + 9} \\ &= \sqrt{34} \end{aligned}$$

$$\begin{aligned} \tan^{-1}\left(\frac{3}{-5}\right) &= -30.96 \\ &= 149.04^\circ \end{aligned}$$

Given $\mathbf{u} = \langle -5, 1 \rangle$ and $\mathbf{v} = \langle 5, 7 \rangle$. Find the following and sketch the resultant vector.

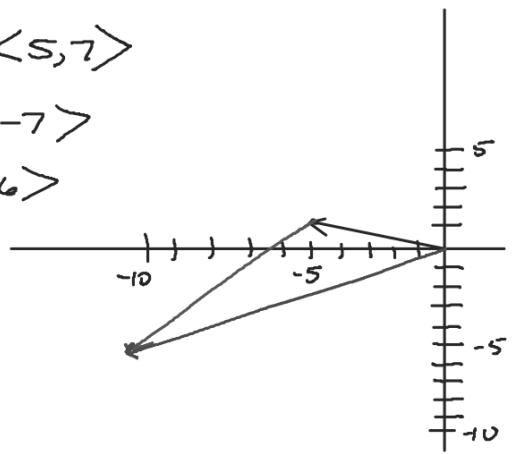
4. $\mathbf{u} + \mathbf{v}$



$$\begin{aligned}\langle -5, 1 \rangle + \langle 5, 7 \rangle \\ \langle -5+5, 1+7 \rangle \\ \langle 0, 8 \rangle\end{aligned}$$

5. $\mathbf{u} - \mathbf{v}$

$$\begin{aligned}\langle 5, 1 \rangle - \langle 5, 7 \rangle \\ \langle 5-5, 1-7 \rangle \\ \langle -10, -6 \rangle\end{aligned}$$



Find the dot product.

$$18. \mathbf{u} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}, \mathbf{v} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$$

$$\begin{aligned} \mathbf{u} \cdot \mathbf{v} &= x_1 x_2 + y_1 y_2 \\ &= (2)(1) + (-3)(5) \\ &= 2 + (-15) \\ &= -13 \end{aligned}$$

Find the angle between the 2 vectors

$$\cos^{-1} \left(\frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}| \cdot |\mathbf{v}|} \right)$$

$$\mathbf{u} = \langle -3, 4 \rangle, \mathbf{v} = \langle -2, 1 \rangle$$

$$\sqrt{(-3)^2 + (4)^2}$$

$$\sqrt{9 + 16}$$

$$\sqrt{25}$$

$$\sqrt{(-2)^2 + (1)^2}$$

$$\sqrt{4 + 1}$$

$$\sqrt{5}$$

$$\frac{(-3)(-2) + (4)(1)}{(\sqrt{25})(\sqrt{5})}$$

$$\begin{aligned} \frac{6 + 4}{5\sqrt{5}} &= \frac{10}{5\sqrt{5}} \\ &= \frac{2}{\sqrt{5}} \end{aligned}$$

$$\cos^{-1} \left(\frac{2}{\sqrt{5}} \right)$$

$$24.57^\circ$$

Determine whether the vectors are parallel, orthogonal, or neither?

| $\mathbf{u} = \langle -2, 4 \rangle$ and $\mathbf{v} = \langle -3, 1 \rangle$

$$(-2)(-3) + (4)(1)$$

$$u = \frac{4}{-2} \quad v = \frac{1}{-3}$$

Neither

$\mathbf{u} = \langle -1, 6 \rangle$ and $\mathbf{v} = \langle 6, -1 \rangle$

$$(-1)(6) + (6)(-1)$$

$$u = \frac{6}{-1} \quad v = \frac{-1}{6}$$

Neither

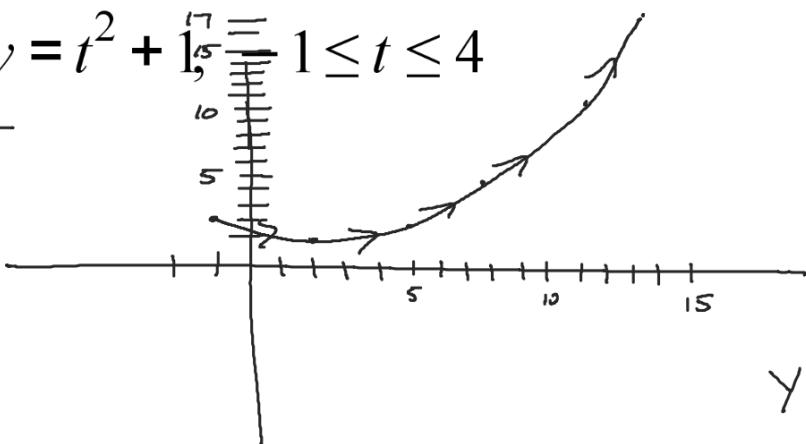
An airplane is flying in the direction 325° with an airspeed of 580 mph. The wind at the altitude of the plane, is blowing from the southwest with a velocity of 60 mph. Find the speed of the jet and the direction it is flying in.

A force of 40 lbs acts on an object at angle of 20° . A second force of 65 pounds acts on the object at an angle if -25° . Find the direction and magnitude of the resultant force.

Graph the pair of parametric equations. Then use algebra to eliminate the parameter.

$$x = 3t + 2, \quad y = t^2 + 1, \quad 1 \leq t \leq 4$$

t	x	y
-1	-1	2
0	2	1
1	5	2
2	8	5
3	11	10
4	14	17



$$x = 3t + 2$$

$$x - 2 = 3t$$

$$t = \frac{x-2}{3}$$

$$y = t^2 + 1$$

$$y = \left(\frac{x-2}{3}\right)^2 + 1$$

$$y = \frac{(x-2)^2}{9} + 1$$

$$= \frac{1}{9}(x-2)^2 + 1$$

Elminate the parameter

$$\begin{aligned}x &= 8 \cos t \\y &= 8 \sin t\end{aligned}\quad = \begin{aligned}\left(\frac{x}{8}\right)^2 &= (\cos t)^2 \\ \left(\frac{y}{8}\right)^2 &= (\sin t)^2\end{aligned}$$

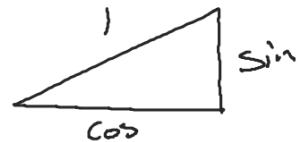
$$\frac{x^2}{64} = \cos^2 t$$

$$\frac{y^2}{64} = \sin^2 t$$

$$\frac{x^2}{64} + \frac{y^2}{64} = \cos^2 t + \sin^2 t$$

$$\frac{x^2}{64} + \frac{y^2}{64} = 1$$

$$x^2 + y^2 = 64$$



Find a parametrizations for the curve.

The line segment with endpoints $A = (5, 2)$ and $B = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$

$$x = x_0 + (\Delta_x) t$$

$$= x_1 + (x_2 - x_1) t$$

$$= 5 + (-2 - 5) t$$

$$x = 5 - 7t$$

$$-2 = 5 - 7t$$

$$-7 = -7t$$

$$t = 1$$

$$t=0$$

$$\begin{matrix} x_1 \\ y_1 \end{matrix} + \begin{pmatrix} x_2 - x_1 \\ y_2 - y_1 \end{pmatrix} t$$

$$y_1 + (y_2 - y_1) t$$

$$2 + (-4 - 2) t$$

$$y = 2 - 6t$$

$$x = 5 - 7t$$

$$y = 2 - 6t$$

$$0 \leq t \leq 1$$

Find a set of parametric equations for a circle with the center at the origin and a radius of 6.

$$x = 6 \cos t$$

$$y = 6 \sin t$$

Find a set of parametric equations for a circle with the center at (2, 3) and a radius of 5.

$$x = 5 \cos t + 2$$

$$y = 5 \sin t + 3$$