$-3i + 1j$

$u = \langle -3, 1 \rangle$

<u>unit vector</u>

$$\frac{\langle -3, 1 \rangle}{\sqrt{10}}$$

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

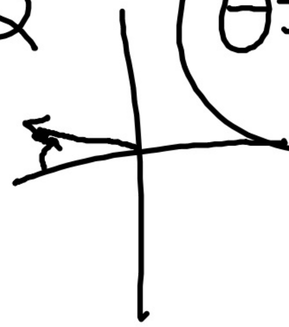
direction ∠

$$\tan\theta = \frac{u_2}{u_1}$$

$$\tan\theta = \frac{-1}{3}$$

$\theta = -18.4°$

Q2



$\theta = 161.6°$

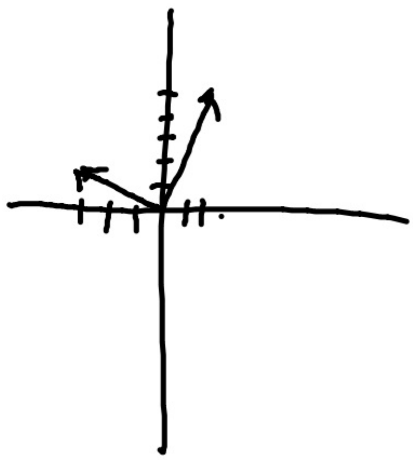
$u = \langle -3, 1 \rangle$

$v = \langle 2, 5 \rangle$

$2v - 3u$

$\langle 4, 10 \rangle - \langle -9, 3 \rangle$

$\langle 13, 7 \rangle$



Angle between

$$\cos\theta = \frac{u \cdot v}{\|u\| \, \|v\|}$$

$$\cos\theta = \frac{-6+5}{\sqrt{10}\,\sqrt{29}}$$

$$\theta = \cos^{-1}\left(\frac{-1}{\sqrt{290}}\right)$$

$$\theta = 93.4^\circ$$

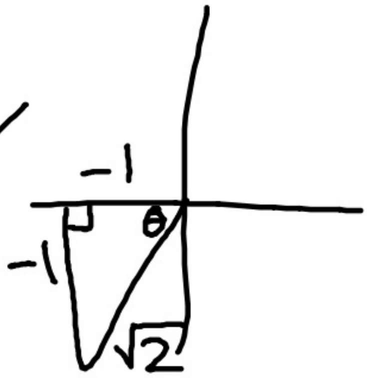
project u onto v

$$\left(\frac{u \cdot v}{\|v\|^2}\right) v$$

$$\left(\frac{-1}{29}\right)\langle 2, 5\rangle$$

$$\left\langle \frac{-2}{29}, \frac{-5}{29} \right\rangle$$

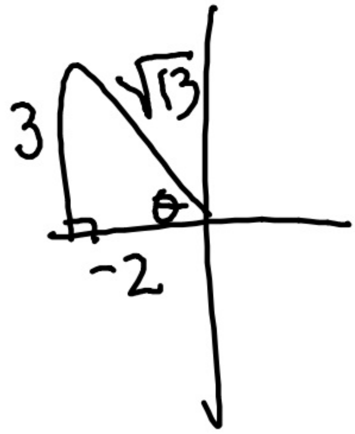
make u
with $\|u\| = 3$
in the direction
of v $\langle -1, -1 \rangle$



$V = \langle -2, 3 \rangle$

$$u = 3\cos\theta\, i + 3\sin\theta\, j$$

$$u = 3\left(-\frac{1}{\sqrt{2}}\right) i + 3\left(\frac{-1}{\sqrt{2}}\right) j$$



$$u = -\frac{3}{\sqrt{2}} i - \frac{3}{\sqrt{2}} j$$

$$u = 3\left(-\frac{2}{\sqrt{13}}\right) i + 3\left(\frac{3}{\sqrt{13}}\right) j$$

$$u = \frac{-6}{\sqrt{13}} i + \frac{9}{\sqrt{13}} j$$

Ex

$$x(t) = 5t - 1$$
$$y(t) = t^2$$

Ex

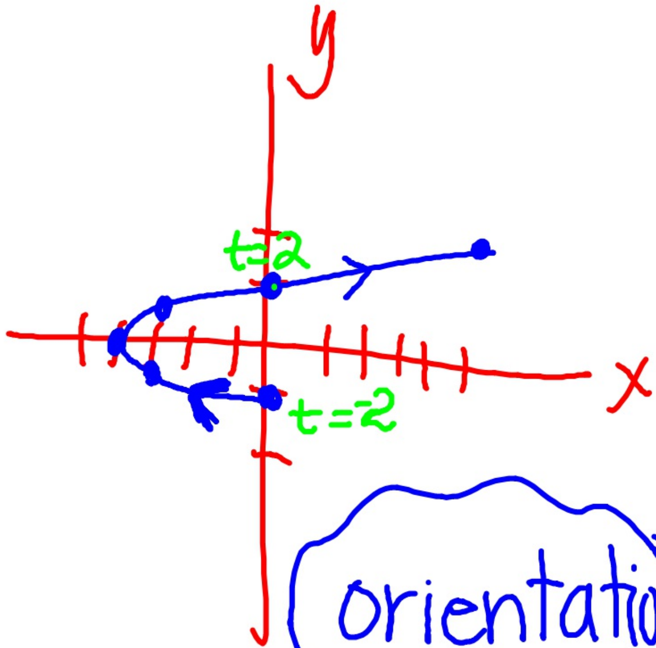
$$x(\theta) = 5\cos\theta$$
$$y(\theta) = -2 + 3\sin\theta$$

Ex $x = t^2 - 4$

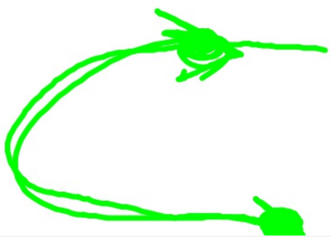
$y = \frac{t}{2}$

$-2 \le t \le 3$

t	x	y
-2	0	-1
-1	-3	$-\frac{1}{2}$
0	-4	0
1	-3	$\frac{1}{2}$
2	0	1
3	5	$\frac{3}{2}$



orientation



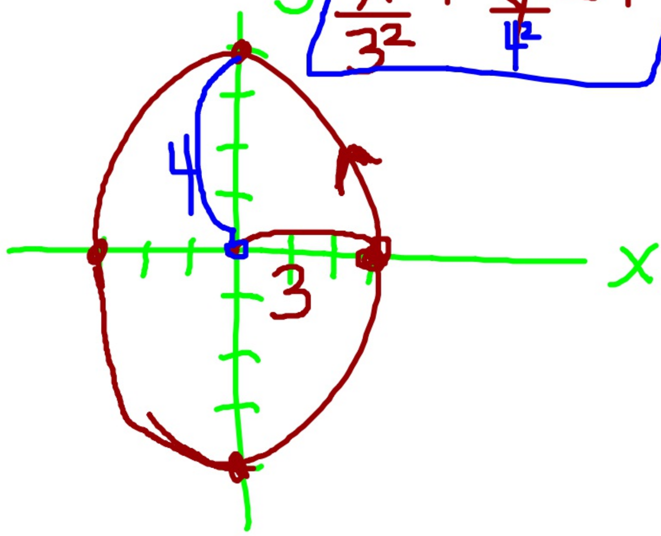
Ex

$$\boxed{\begin{aligned} x &= 3\cos\theta \\ y &= 4\sin\theta \end{aligned}}$$

$0 \le \theta \le 2\pi$

$$\boxed{\frac{x^2}{3^2} + \frac{y^2}{4^2} = 1}$$

θ	x	y
0	3	0
$\frac{\pi}{2}$	0	4
π	-3	0
$\frac{3\pi}{2}$	0	-4
2π	3	0



Ex what does it look like?

$$x = 2\cos\theta$$
$$y = 5\tan\theta$$

Converting Parametric to Rectangular Form

- eliminate the parameter
- only x/y remain.
- solve for standard form

$$y = mx + b$$

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

$$y = ax^2 + bx + c$$

Ex $x = 3\cos\theta$
$y = 4\sin\theta$

eliminate the parameter & write in SF

- w/ trig use a pyth. identity

$\sin^2\theta + \cos^2\theta = 1$

- solve the par. equation for the trig words:

$x = 3\cos\theta$ | $y = 4\sin\theta$

$\cos\theta = \frac{x}{3}$ | $\sin\theta = \frac{y}{4}$

- substitute into the pythag ID.

$\sin^2\theta + \cos^2\theta = 1$

$\left(\frac{y}{4}\right)^2 + \left(\frac{x}{3}\right)^2 = 1$ simplify to SF

$$\boxed{\frac{y^2}{16} + \frac{x^2}{9} = 1}$$

Ellipse

Ex $x(t) = t^2 - 4$

$y(t) = \frac{t}{2}$

$y = \frac{t}{2}$

$t = 2y$

$t^2 - 4 = x$

$(2y)^2 - 4 = x$

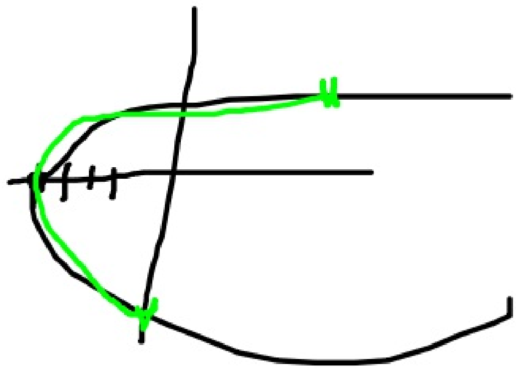
$4y^2 - 4 = x$

$x = 4(y-0)^2 - 4$

$x = a(y-k)^2 + h$

$a \rightarrow \frac{1}{4c}$

- choose the "easier" eqn to solve for t
- plug t's value into other & simplify to SF.



Write a rectangular as a parametric

$y = 3x - 7$; use $t = 1 - x$

rewrite so

$x =$

$t = 1 - x$

$$\boxed{\begin{aligned} x &= 1 - t \\ y &= -(3t+4) \end{aligned}}$$

$y = 3(1 - t) - 7$

$y = 3 - 3t - 7$

$y = -3t - 4$

Hwk: p530