TOPIC: ELIMINATE THE PARAMETER

Eliminating the Parameter

◆ You'll often have to graph parametric eq'ns and "**eliminate the (t) parameter**", leaving an eq'n with *only* x & y.

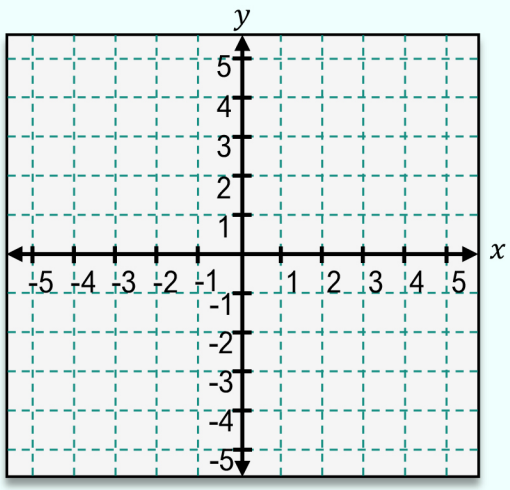
- Given $x(t)$ & $y(t)$, solve _____ eq'n for t, then substitute.

New **Eliminate the Parameter**

$$\left.\begin{array}{l} x = t - 2 \\ \\ y = 3t^2 \end{array}\right\} y = 3(\_\_\_\_\_)^2$$

EXAMPLE Graph the parametric equations, then eliminate the parameter to convert them to a rectangular equation.

$x(t) = \sqrt{t}, \quad y(t) = t - 3; \quad t \geq 0$



t	$x(t)$	$y(t)$
0		
1		
2		
3		
4		

◆ **Note:** If given parametric eq'n restrict t interval, the graph is usually a small portion of the rectangular eq'n.

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PRACTICE Eliminate the parameter to rewrite the following as a rectangular equation.

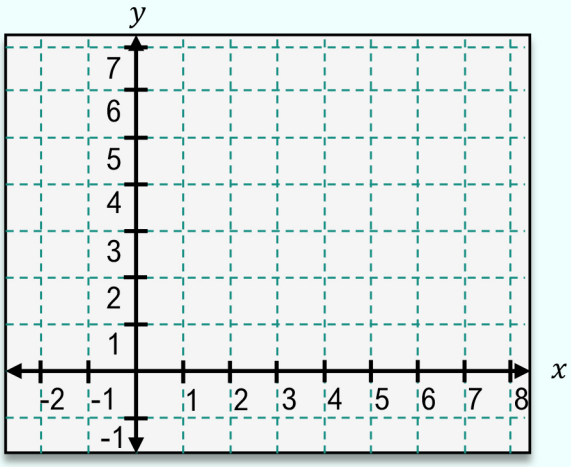
$x(t) = 2t - 1$

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

EXAMPLE Graph the plane curve of the parametric equations. Write the equivalent rectangular equation.

$$x(t) = t^2 - 1; \qquad y(t) = t^2 - 2$$

$$-\infty \leq t \leq \infty$$



t	x	y

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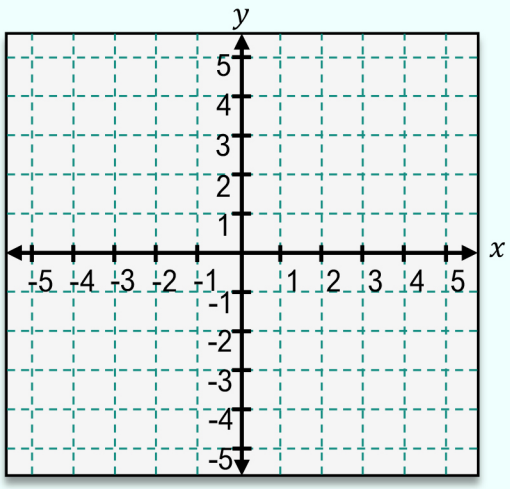
EXAMPLE Graph the plane curve of the parametric equations. Write the equivalent rectangular equation.

$$x(t) = t - 3; \qquad y(t) = \frac{1}{t-5}$$

$$t \neq 5$$



t	x	y
0		
3		
4.8		
5.2		
7		

TOPIC: ELIMINATE THE PARAMETER

Equations with Trigonometric Functions

- To eliminate the parameter from $x(t)$ & $y(t)$ with trig, rewrite ***BOTH*** eq'ns and use a Pythagorean Identity.

EXAMPLE Eliminate the parameter.

Recall **Eliminate the Parameter**

*Solve **ONE** eq'n for t*

$$x = t - 2 \qquad y = 3t^2$$

$$y = 3(x+2)^2$$

New **Eliminate Parameter with Trig**

*Solve **BOTH** eqn's for _____*

$$x = \cos t \qquad y = 3\sin t$$

Recall

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

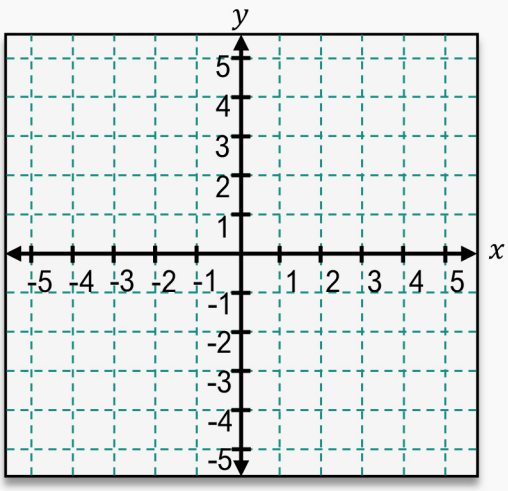
$\tan^2\theta + 1 = \sec^2\theta$

$1 + \cot^2\theta = \csc^2\theta$

(Pythagorean Identities)

PRACTICE First eliminate the parameter, then graph the plane curve of the parametric equations.

$$x(t) = 2 + \cos t \quad y(t) = -1 + \sin t; \qquad 0 \le t \le 2\pi$$



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EXAMPLE First eliminate the parameter, then graph the plane curve of the parametric equations.

$$x(t) = 3\cos t; \qquad y(t) = 2\sin t$$

$$\pi \leq t \leq 2\pi$$