Unit #4: Parametric and Polar Equations
Topic: Parametric Equations
Objective: SWBAT analyze parametric equations by identifying points, graphing, and eliminating the parameter.

Parametric Equations:

Imagine hitting a golf ball and watching its flight path until it lands. We can write rectangular equations that model the height of the ball as a function of the distance travelled, but often we are interested in analyzing each of these separately as a function of time.

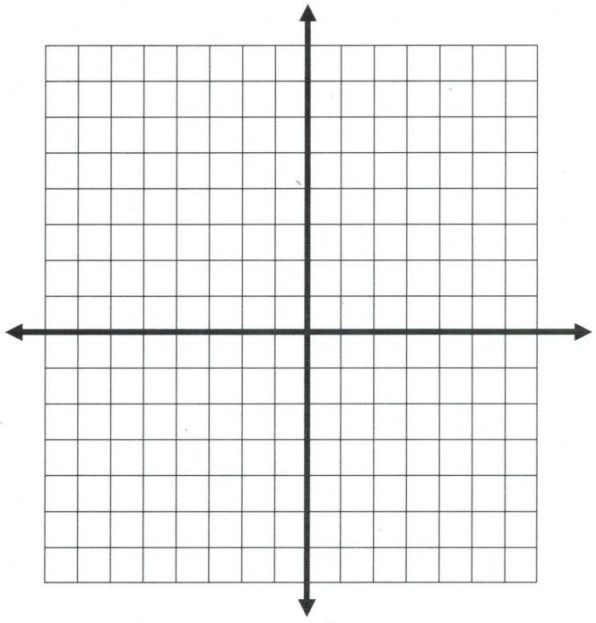
To do this, we would need two separate equations, one to model the height of the ball (call it y) as a function of time, t, and another to model the distance the ball travels (call it x) as a function of time, t. This is the idea behind parametric equations.

In general, parametric equations are a pair of equations that involve a third, independent variable which usually represents time. Both x and y are now dependent variables.

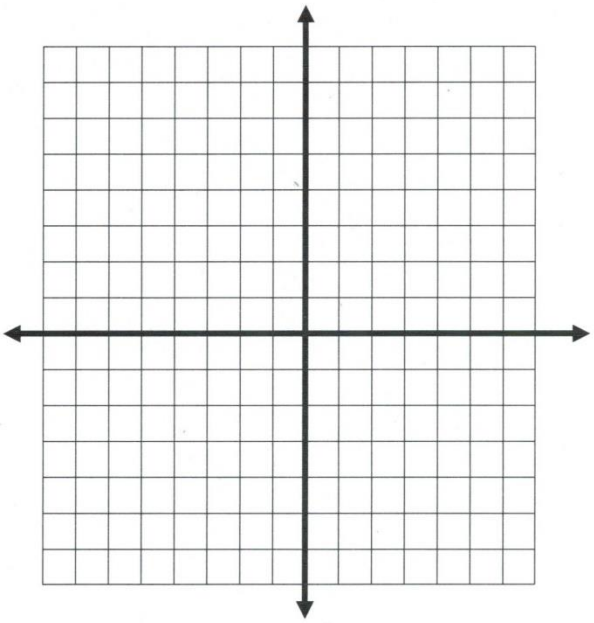
Example #1:

A particle moves through the xy-plane. Its position at given in feet at time t seconds is modeled by the equations below. Without a calculator, make a table, and sketch the curve the particle follows, indicating its direction. Then eliminate the parameter.

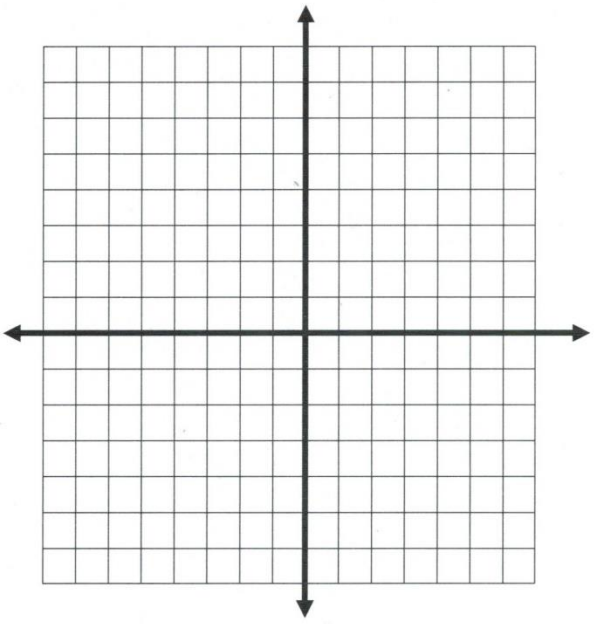
$x = t^2 - 4$ and $y = \frac{t}{2}$, $-2 \le t \le 3$



Example #2: Do the same for $x = \frac{1}{\sqrt{t+1}}$, $y = \frac{t}{t+1}$ for $t \geq 0$.



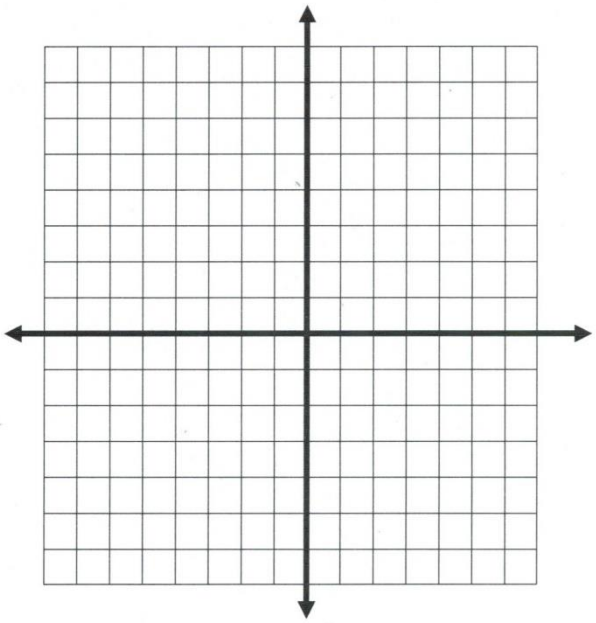
Example #3: Do the same for $= 2 + 3cost$, $y = -1 + 2sint$, for $0 \leq t \leq 2\pi$.



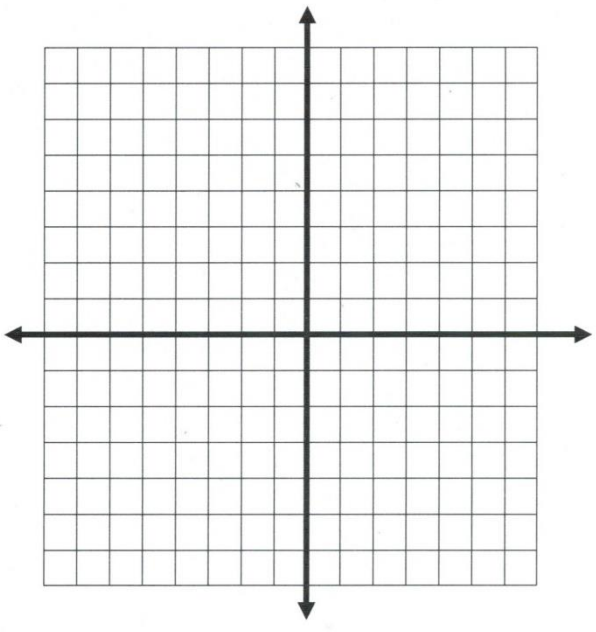
In example #3 we made use of the trigonometric identity _____ to sketch an _____. Which trigonometric identity would you use to obtain the graph of a _____?

Problem Set #1: For each of the following, sketch the curve represented by the parametric equations and eliminate the parameter and write the corresponding rectangular equation.
CALCULATOR ALLOWED

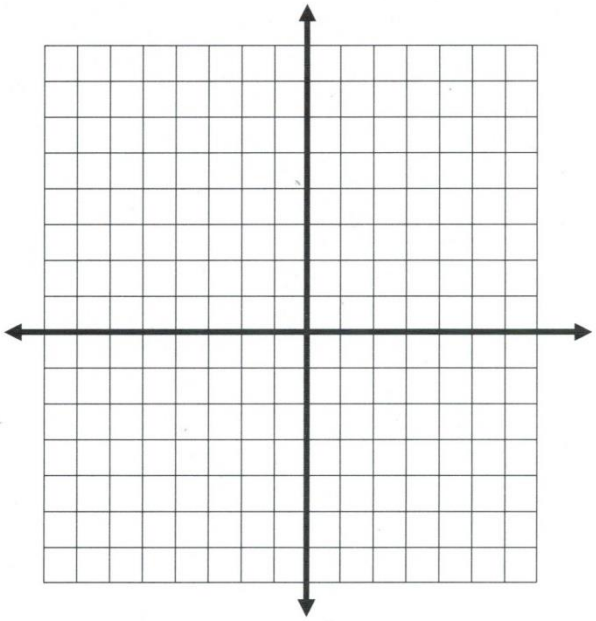
1. $x = 3 - 2t \quad -2 \leq t \leq 2$
   $y = 2 + 3t$



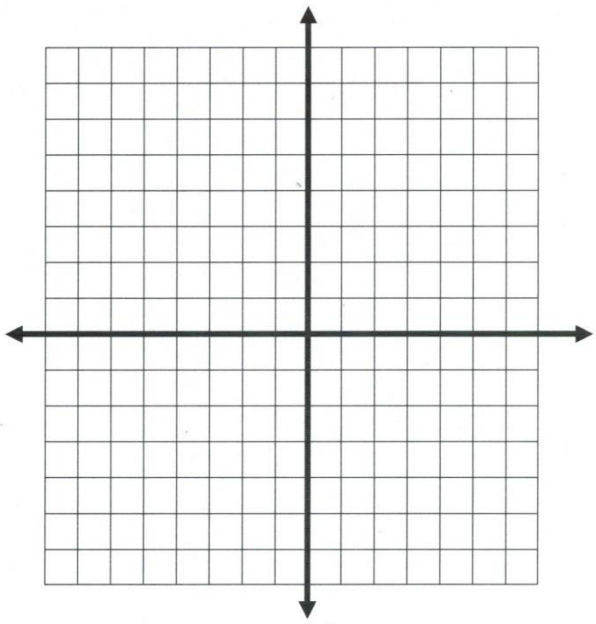
2. $x = ln(2t) \quad t > 0$
   $y = 2t^2$



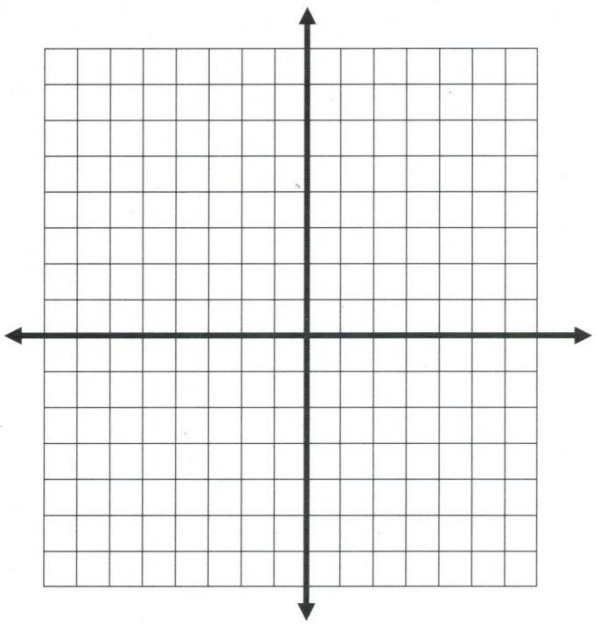
3. $x = 4sin(2\theta)$ $\quad 0 \leq t \leq \pi$
   $y = 2cos(2\theta)$



4. $x = e^{2t}$ $\quad -1 \leq t \leq 3$
   $y = e^{t}$



5. $x = \frac{1}{t}$ $\quad \frac{1}{2} \leq t \leq 5$
   $y = t + 1$



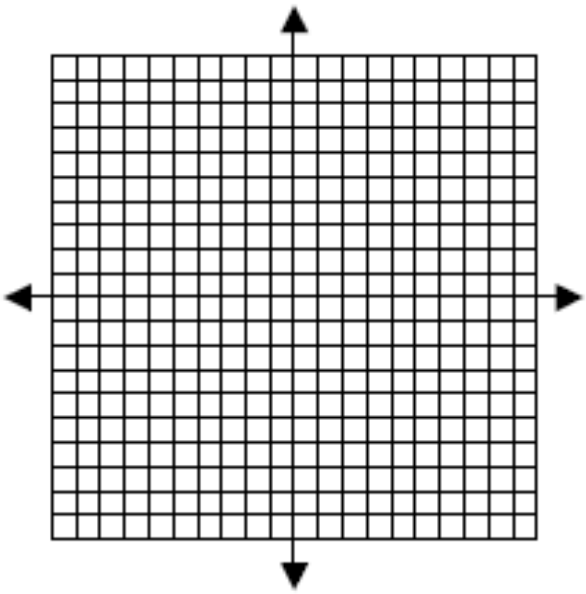
Name _____ U4L1 Homework

1. Fill in the table and sketch the parametric equation for t [-2,6]

$x = \sqrt{t^2 + 1}$

$y = 2 - t$

t	x	y
-2		
-1		
0		
1		
2		
3		
4		
5		
6		



Problems 2-10: Eliminate the parameter to write the parametric equations as a rectangular equation.

2. $x = \frac{1}{t - 2}$
   $y = 4t + 5$

3. $x = 6 - t$
   $y = \sqrt{3t - 4}$

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

5. $x = 3 \cos t$
   $y = 3 \sin t$

6. $x = 4 \sin (2t)$
   $y = 2 \cos (2t)$

7. $x = e^{-t}$
   $y = e^{3t}$

8. $x = t^3$
   $y = 3lnt$

9. $x = \frac{1}{4}t$
   $y = t^2$

10. $x = t + 2$
    $y = t^2$