

Unit #4: Parametric and Polar Equations

Topic: Parametric Equations

Objective: SWBAT analyze parametric equations by identifying points, graphing, and

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.

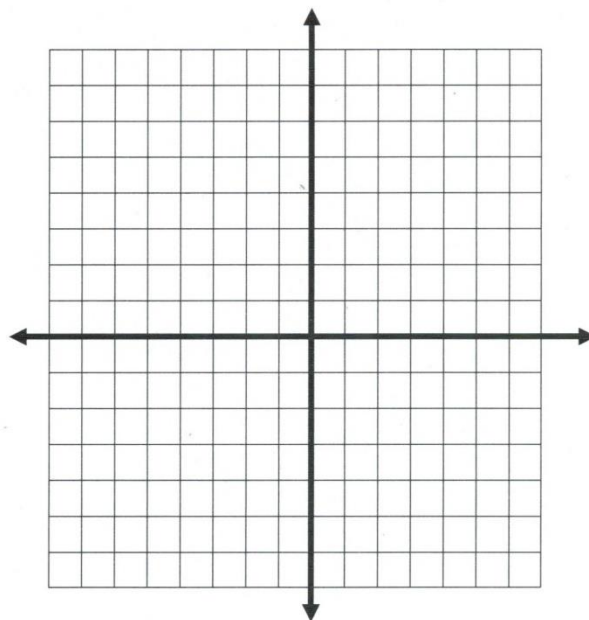
To do this, we would need two separate equations, one to model the height of the ball (call it y) as a function of time, t , and another to model the distance the ball travels (call it x) as a function of time, t . This is the idea behind parametric equations.

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.

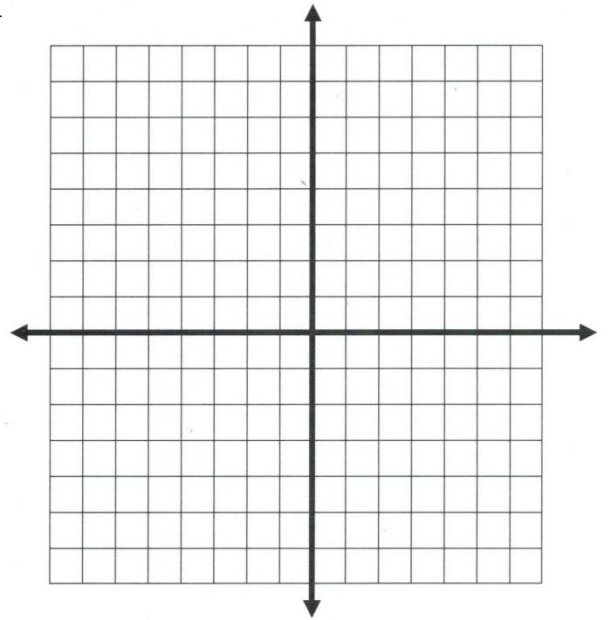
Example #1:

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.

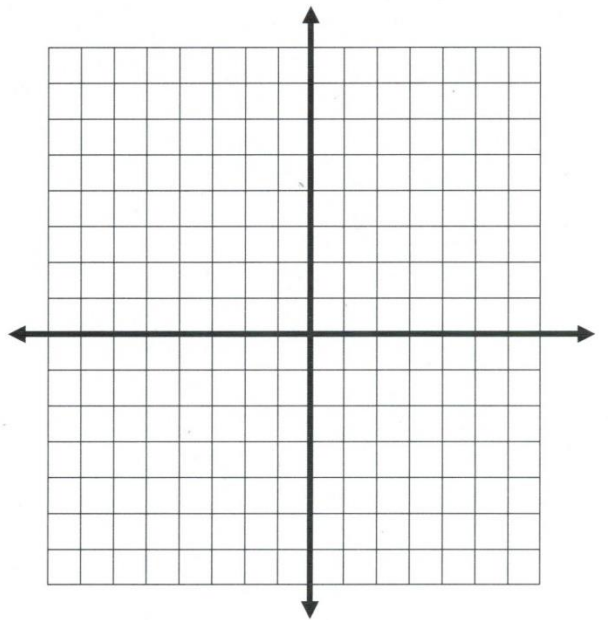
$$x = t^2 - 4 \quad \text{and} \quad y = \frac{t}{2}, \quad -2 \leq t \leq 3$$



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 $x = 2 + 3\cos t$, $y = -1 + 2\sin t$, 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 _____?

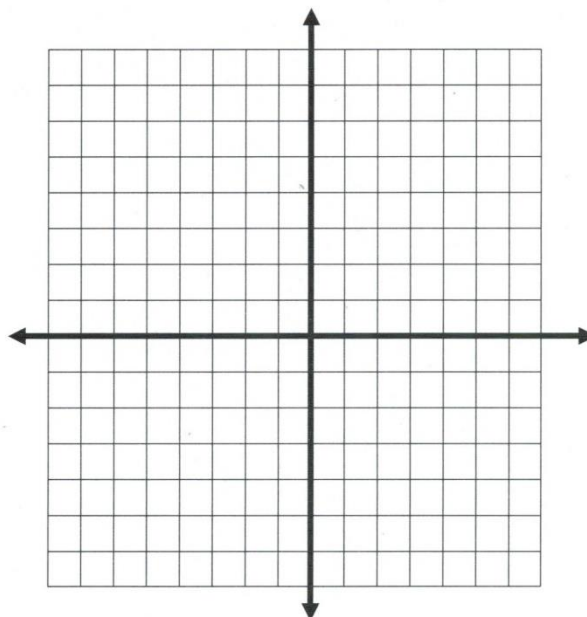


Assignment(s): pg. 736 – 37 #1 – 8, 13, 15, 21, 23, and 25

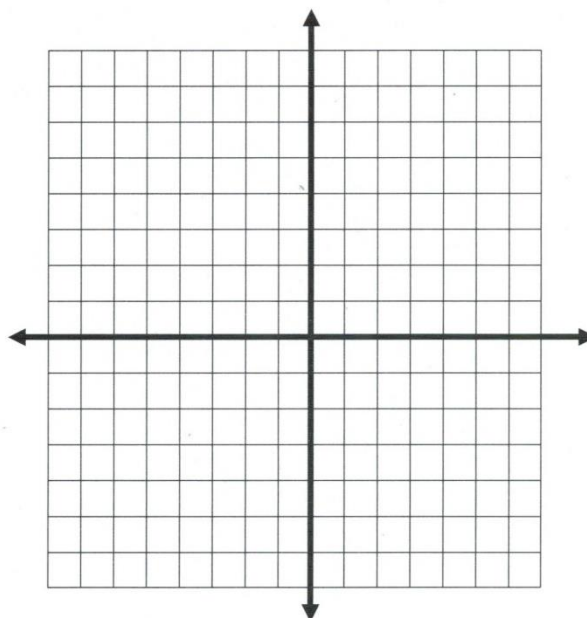
Problem Set #1: For each of the following, sketch the curve represented by the parametric equations and eliminate the parameter and write the corresponding rectangular equation.

CALCULATOR ALLOWED

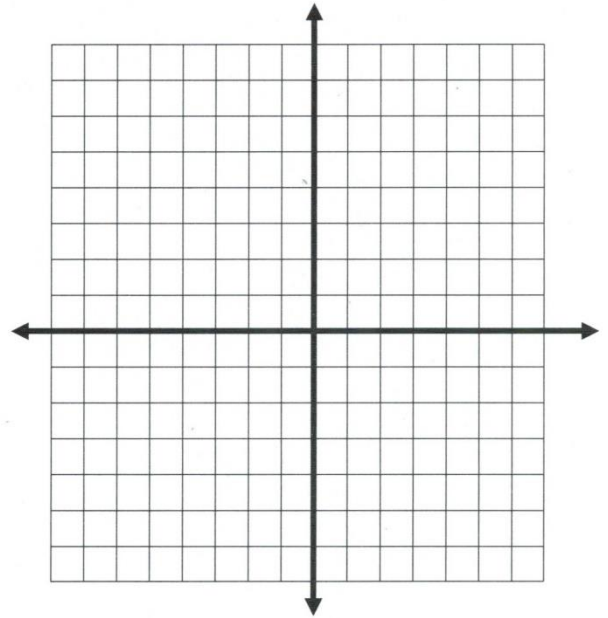
1. $x = 3 - 2t \quad -2 \leq t \leq 2$
 $y = 2 + 3t$



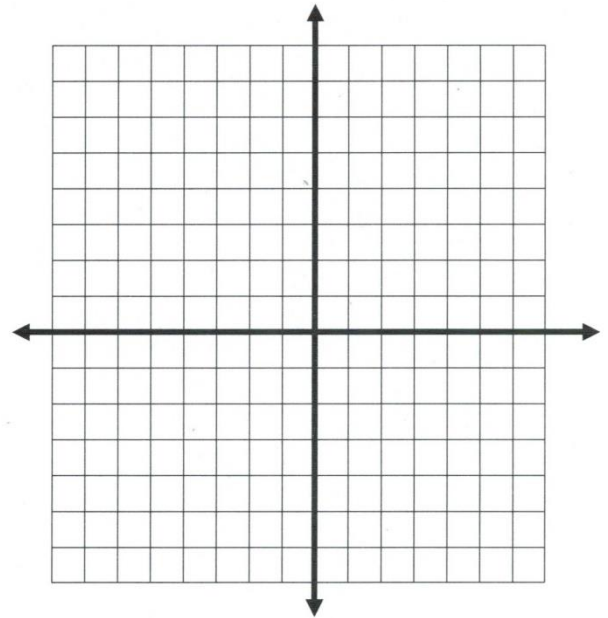
2. $x = \ln(2t) \quad t > 0$
 $y = 2t^2$



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



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



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

