Precalc 10.6

Recognize conic sections by their equations
Find a rectangular equation for a curve defined parametrically
Find a parametric equation for a curve defined rectangularly

general conic equation $Ax^2 + By^2 + Cxy + Dx + Ey + F = 0$

parametric equation

$\sin^2 + \cos^2 = 1$ (pythagorean identity)

Disectible conics
Graphing calculator: parametric mode

General Equation for Conic Sections	The equation of a conic section can be written in the form $$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0,$$ where A, B, and C are not all zero.

Which parts are present? Which parts are missing?

General Form: $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$		
Conic Section	**Standard Form of Equation**	**Variation of General Form of Conic Equations**
circle	$(x-h)^2 + (y-k)^2 = r^2$	$A = C$
parabola	$(y-k)^2 = 4p(x-h)$ or $(x-h)^2 = 4p(y-k)$	Either A or C is zero.
ellipse	$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ or $\frac{(y-k)^2}{a^2} + \frac{(x-h)^2}{b^2} = 1$	A and C have the same sign and $A \neq C$.
hyperbola	$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$ or $\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$	A and C have opposite signs.
	$xy = k$	$A = C = D = E = 0$

Remember that graphs can also be degenerate cases.

Works as long as there is no xy term (rotation)

1 **Identify the conic section represented by each equation.**

Explain how you know...

a. $6y^2 + 3x - 4y - 12 = 0$

P

b. $3y^2 - 2x^2 + 5y - x - 15 = 0$

H

c. $9x^2 + 27y^2 - 6x - 108y + 82 = 0$

e

d. $4x^2 + 4y^2 + 5x + 2y - 150 = 0$ = c

4 4

Identify the conic section represented by each equation. Then write the equation in standard form and graph the equation.

4. $x^2 + 9y^2 + 2x - 18y + 1 = 0$

$(x^2+2x+1) + 9(y^2-2y+1)$

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

x^2

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

5. $y^2 - 8x = -8$

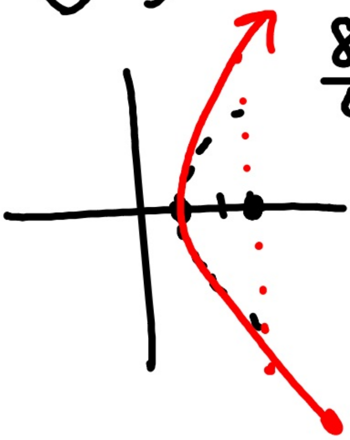
$y^2 = 4px$

$y^2 = 8x - 8$

$(y-0)^2 = 8(x-1)$

$\frac{8}{4} = \frac{4p}{4}$

$2 = p$



The general form for a set of parametric equations is

$$x = f(t) \text{ and } y = g(t), \text{ where } t \text{ is in some interval } I.$$

$x = f(t)$

$y = g(t)$

throw a ball

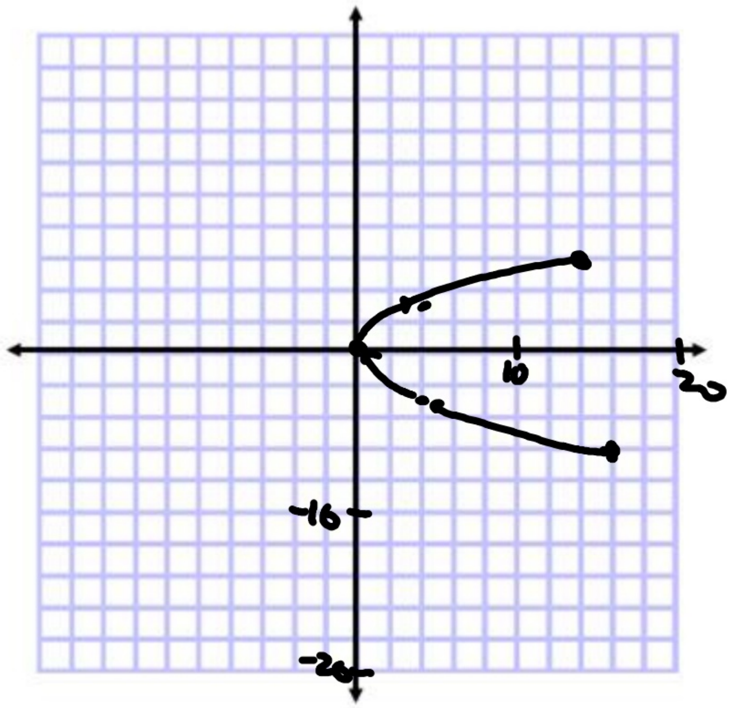
2 **Graph the curve defined by the parametric equations $\boxed{x = 4t^2 \text{ and } y = 3t}$, where $-2 \le t \le 2$. Then identify the curve by finding the corresponding rectangular equation.**

$x = 4t^2$

$y = 3t$

Table of values:

t	x	y
-2	16	-6
-1	4	-3
0	0	0
1	4	3
2	16	6



x^{2}

3 Find the rectangular equation of the curve whose parametric equations are $x = 2\cos t$ and $y = 2\sin t$, where $0 \le t \le 2\pi$. Then graph the equation using arrows to indicate how the graph is traced.

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

$\frac{x}{2} = \frac{2\cos T}{2}$ $\quad$ $\frac{y}{2} = \frac{2\sin T}{2}$

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

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

$2\cos T$ $\quad$ $2\sin T$

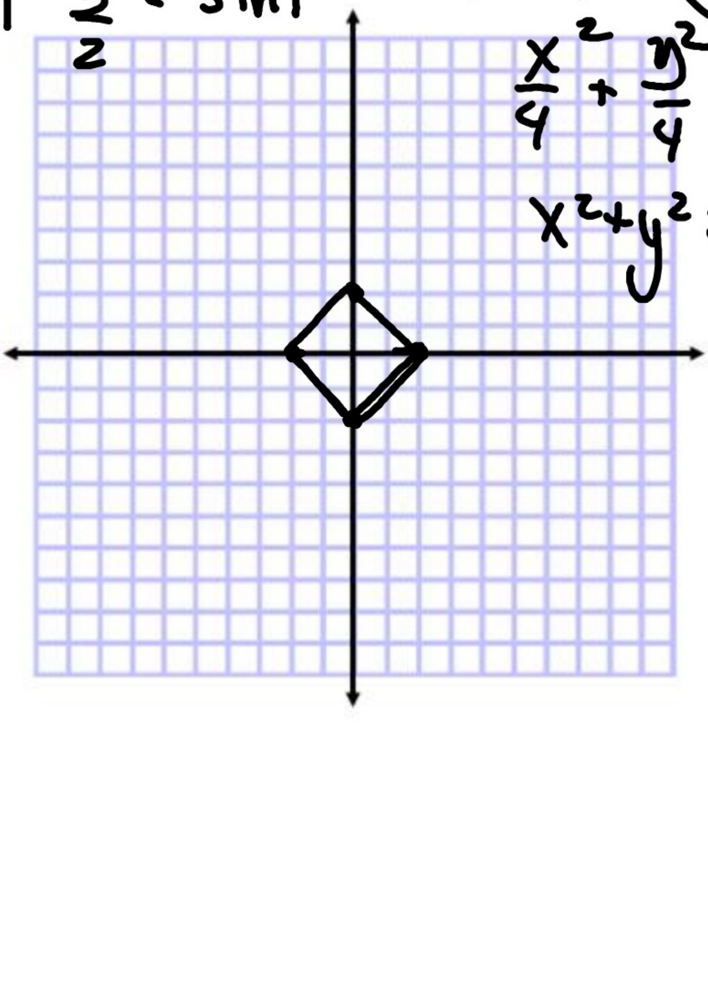
$\frac{x}{2} = \cos T$ $\quad$ $\frac{y}{2} = \sin T$

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

$x^2 + y^2 = 4$

Table of values:

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



let x=t

4 **Find parametric equations for the equation $y = x^2 + 3$.**

13-270

Find the rectangular equation of the curve whose parametric equations are given. Then graph the equation using arrows to indicate orientation.

8. $x = t, y = -t^2 - 6t + 2; -\infty < t < \infty$

9. $x = 2 \cos t, y = 3 \sin t; 0 \leq t \leq 2\pi$

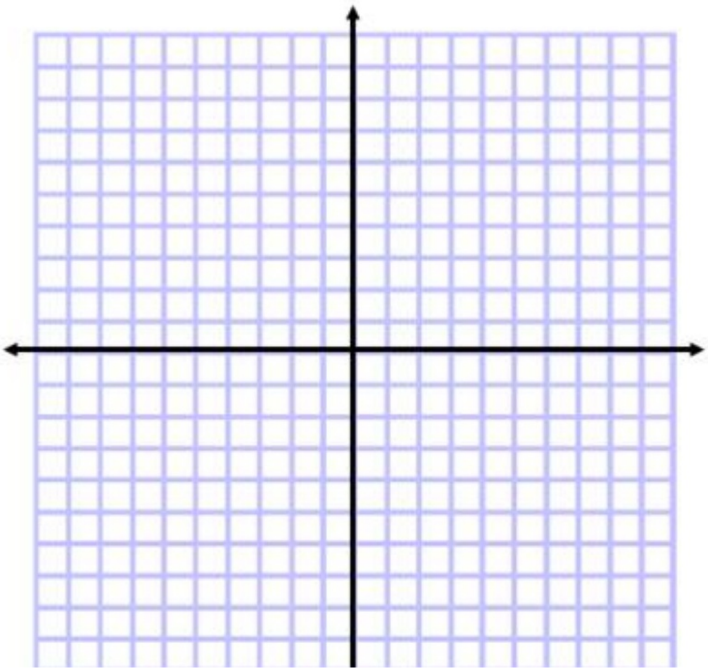
Table of values:

t	x	y

Table of values:

t	x	y

what would be a good window'



Find parametric equations for each rectangular equation.

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

10. $y = 2x^2 - 5x$

11. $x^2 + y^2 = 36$

Graphing calculator activity p. 665

(radians t-step =0.05)