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

parametric equation

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

$e = \frac{c}{a}$ ellip < 1, hyp. > 1, par. $= 1$

rotation

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.

Graphing calculator: parametric mode

because...what if they were?

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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)

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1 Identify the conic section represented by each equation.

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

Explain how you know...

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

4. $x^2 + 9y^2 + 2x - 18y + 1 = 0$ 5. $y^2 - 8x = -8$

ellipse

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

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

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

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The general form for a set of parametric equations is

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

throw a ball

$x = f(t)$
$y = f(t)$

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

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

$y^2 = 4px$

Table of values:

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

$x = 4(\frac{1}{3}y)^2$

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

$9x = 4y^2$

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

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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.

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

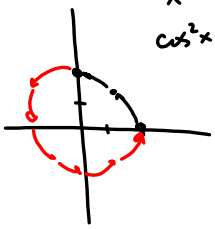
$x^2 + y^2 = 1$

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

Table of values:

t	x	y
0	2	0
$\frac{\pi}{4}$	1.4	1.4
$\frac{\pi}{2}$	0	2
$\frac{3\pi}{4}$		

$2\cos t$ $2\sin t$ $2\sqrt{2}$



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let x=t

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

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

Table of values:

t x y

Table of values:

t x y

what would be a good window?

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Find parametric equations for each rectangular equation.

10. $y = 2x^2 - 5x$ 11. $x^2 + y^2 = 36$

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

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Graphing calculator activity

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