

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)

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 $(x - h)^2 = 4p(y - k)$	<u>Either A or C is zero.</u>
ellipse	$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$ or $\frac{(y - k)^2}{a^2} + \frac{(x - h)^2}{b^2} = 1$	<u>A and C have the same sign and $A \neq C$.</u>
hyperbola	$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$ or $\frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$	<u>A and C have opposite signs.</u>
	$xy = k$	$A = C = D = E = 0$

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

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

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

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

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

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

The general form for a set of parametric equations is

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

$$v = f(x)$$

$$h = g(t)$$



x and y coordinates are each functions of some other thing (time)

Ex: throw a ball

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

Table of values:

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

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

$$y^2 = 4x$$

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

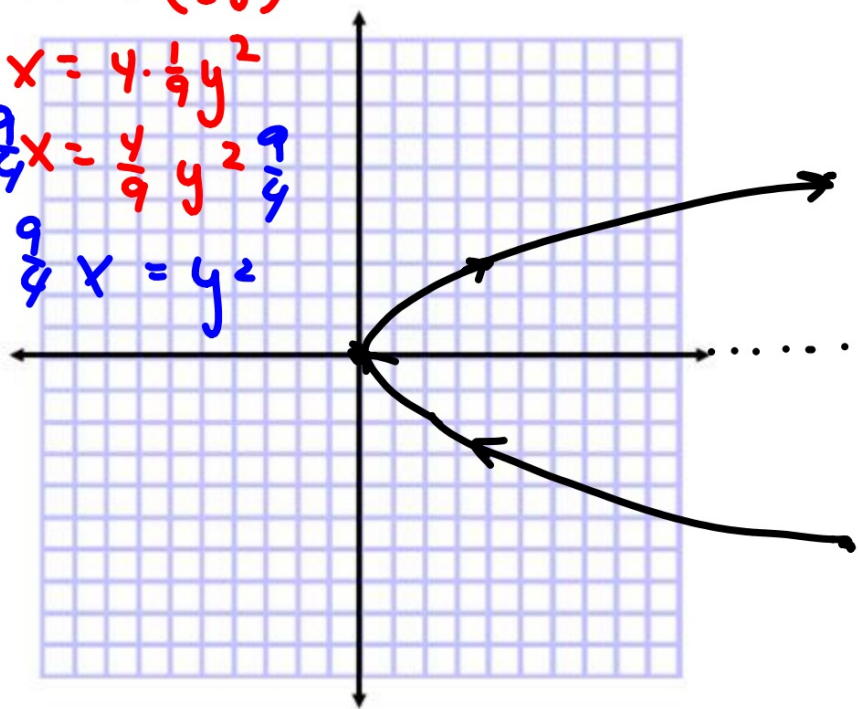
$$x = 4 \cdot \frac{1}{9}y^2$$

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

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

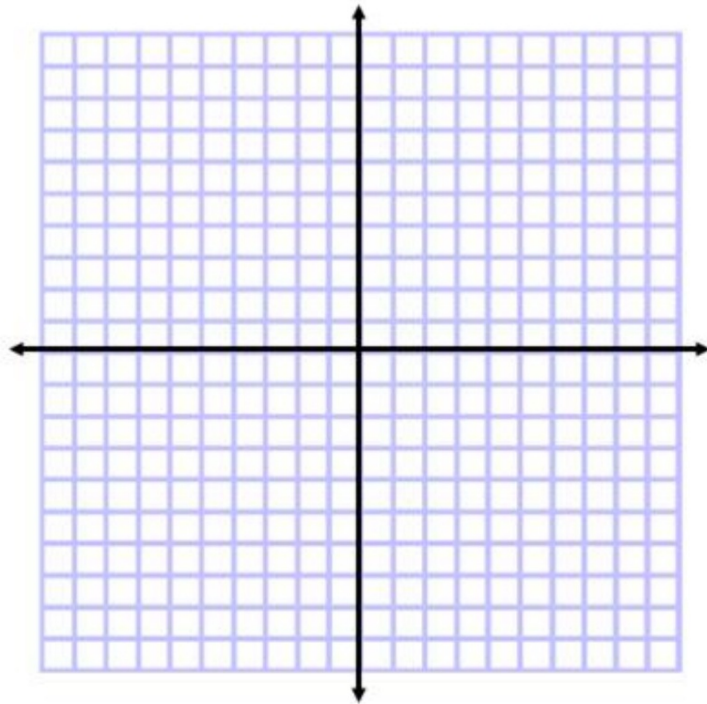
$$y = 3t$$

$$\frac{1}{3}y = \frac{y}{3} = t$$



- $$\cos^2 x + \sin$$

13-25 old

$$\underline{\quad t \quad \quad x \quad \quad y \quad}$$


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

let x

Table of values:

$$\underline{\quad t \quad \quad x \quad \quad y \quad}$$

A blank coordinate plane with a grid. The grid is composed of small squares, and the x and y axes are represented by black lines with arrows at the ends. The origin is at the center of the grid.

Find parametric equations for each rectangular equation.

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

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

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

Graphing calculator activity p. 665

(radians t-step =0.05)