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 $(x-h)^2 = 4p(y-k)$ | 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)

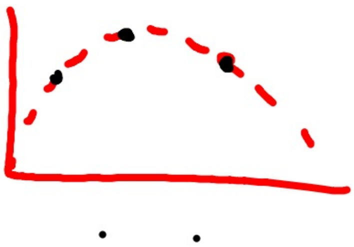
T

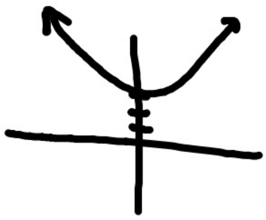
let x=t

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

$x_1 = T$

$y_1 = T^2 + 3$





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

8. $x = t$, $\boxed{y = -t^2 - 6t + 2}$ $-\infty < t < \infty$ 9. $x = 2\cos t$, $y = 3\sin t$; $0 \le t \le 2\pi$

Table of values:

| t | x | y |
|---|---|---|
| -10 | -10 | $-(-10)^2-6(-10)+2 = -38$; $-100+60+2$ |
| -5 | -5 | $-(-5)^2-6\cdot5+2$; $-25+30+2 = 7$ |
| 0 | 0 | 2 |
| 5 | 5 | $-5^2-6\cdot5+2$ -53; $-25-30+2$ |
| 10 | 10 | $-100-60+2$ -158 |

what would be a good window'

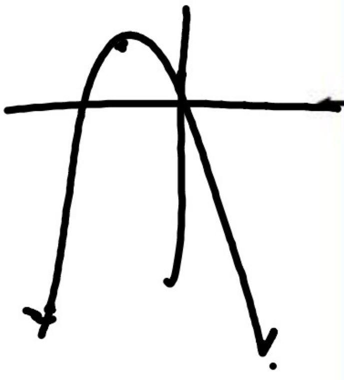
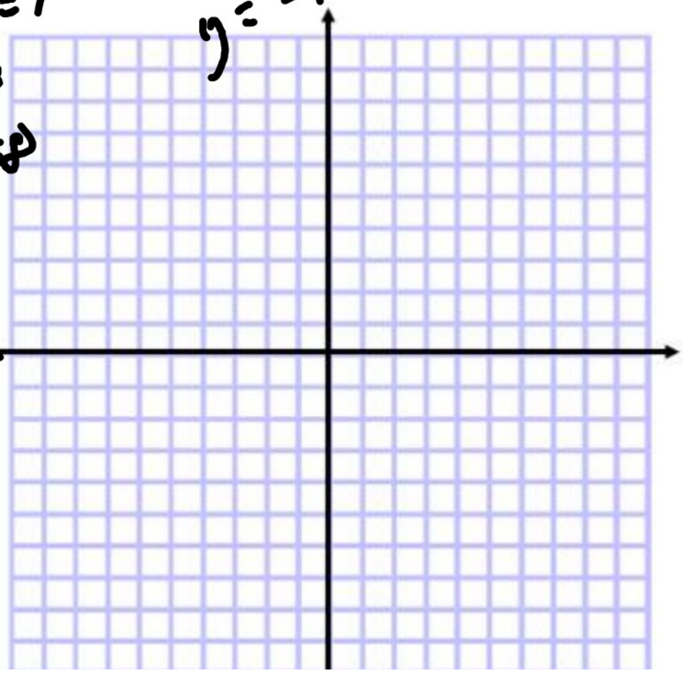


Table of values:

| t | x | y |
|---|---|---|

$x = T$

$y = -T^2 - 6t + 2$



$\frac{x}{2} = \frac{2\cos T}{2}$ $\frac{y}{3} = \frac{3\sin T}{3}$ $0 \leq T \leq 2\pi$

$\frac{x}{2} = \cos T$ $\frac{y}{3} = \sin T$

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

$x = 2\cos T$

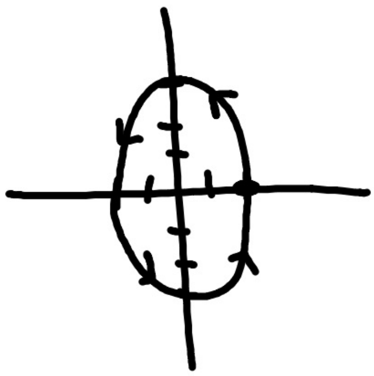
$y = 3\sin T$

$(\cos T)^2 + (\sin T)^2 = 1$

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

$\frac{x}{2} \cdot \frac{x}{2}$ $\frac{y}{3} \cdot \frac{y}{3}$

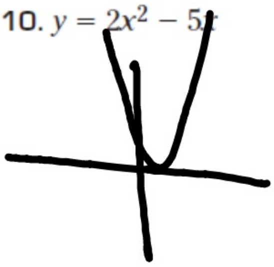
$\frac{x^2}{4} + \frac{y^2}{9} = 1$



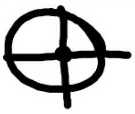
Find parametric equations for each rectangular equation.

$\boxed{\cos^2 t + \sin^2 t = 1}$

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



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



$$\left(\frac{x}{6}\right)^2 + \left(\frac{y}{6}\right)^2 = 1$$

$$6 \cdot \frac{x}{6} = \cos T \cdot 6 \qquad 6 \cdot \frac{y}{6} = \sin T \cdot 6$$

$x_1 = T$

$y_1 = 2T^2 - 5T$

$x_1 = 6\cos T$

$y_1 = 6\sin T$

Graphing calculator activity p. 665

(radians t-step =0.05)