EXAMPLE 2 Solve a linear-quadratic system by substitution

Solve the system using substitution.

$x^2 + y^2 = 10$ **Equation 1**
$y = -3x + 10$ **Equation 2**

Solution

Substitute $-3x + 10$ for y in Equation 1 and solve for x.

$x^2 + y^2 = 10$	**Equation 1**
$x^2 + (-3x + 10)^2 = 10$	**Substitute for *y*.**
$x^2 + 9x^2 - 60x + 100 = 10$	**Expand the power.**
$10x^2 - 60x + 90 = 0$	**Combine like terms.**
$x^2 - 6x + 9 = 0$	**Divide each side by 10.**
$(x - 3)^2 = 0$	**Perfect square trinomial**
$x = 3$	**Zero product property**

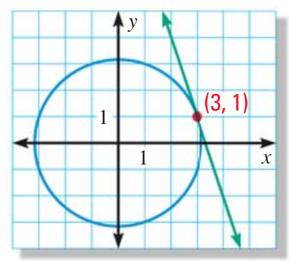
AVOID ERRORS
You can also substitute $x = 3$ in Equation 1 to find y. This yields *two* apparent solutions, (3, 1) and (3, −1). However, (3, −1) is extraneous because it does not satisfy Equation 2.

To find the y-coordinate of the solution, substitute $x = 3$ in Equation 2.

$y = -3(3) + 10 = 1$

▶ The solution is (3, 1).

CHECK You can check the solution by graphing the equations in the system. You can see from the graph shown that the line and the circle intersect only at the point (3, 1).



✓ GUIDED PRACTICE for Examples 1 and 2

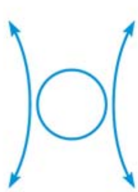
Solve the system using a graphing calculator.

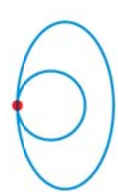
1. $x^2 + y^2 = 13$
   $y = x - 1$
2. $x^2 + 8y^2 - 4 = 0$
   $y = 2x + 7$
3. $y^2 + 6x - 1 = 0$
   $y = -0.4x + 2.6$

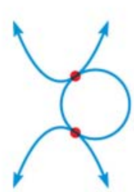
Solve the system using substitution.

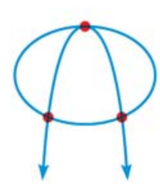
4. $y = 0.5x - 3$
   $x^2 + 4y^2 - 4 = 0$
5. $y^2 - 2x - 10 = 0$
   $y = -x - 1$
6. $y = 4x - 8$
   $9x^2 - y^2 - 36 = 0$

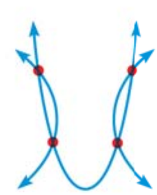
QUADRATIC SYSTEMS Two distinct conic sections can have from zero to four points of intersection. Several possible scenarios are shown below.


No solution


One solution


Two solutions


Three solutions


Four solutions

In the examples on the next page, you will use elimination to solve systems of two second-degree equations.