Name ______________________ Class ____________ Date ____________

4-9 Reteaching

Quadratic Systems

You used graphing and substitution to solve systems of linear equations. You can use these same methods to solve systems involving quadratic equations.

Problem

What is the solution of the system of equations? $\begin{cases} y = x^2 - 2x - 8 \\ y = 2x - 3 \end{cases}$

$y = 2x - 3$	Write one equation.
$x^2 - 2x - 8 = 2x - 3$	Substitute $x^2 - 2x - 8$ for y in the linear equation.
$x^2 - 4x - 5 = 0$	Write in standard form.
$(x + 1)(x - 5) = 0$	Factor the quadratic expression.
$x + 1 = 0$ or $x - 5 = 0$	Use the Zero-Product Property.
$x = -1$ or $x = 5$	Solve for x.

Because the solutions to the system of equations are ordered pairs of the form (x, y), solve for y by substituting each value of x into the linear equation. You can use either equation, but the linear equation is easier.

$x = -1$: $y = 2x - 3 = 2(-1) - 3 = -5 \rightarrow (-1, -5)$
$x = 5$: $y = 2x - 3 = 2(5) - 3 = 7 \rightarrow (5, 7)$

The solutions are $(-1, -5)$ and $(5, 7)$. Check these by graphing the system and identifying the points of intersection.

Exercises

Solve each system.

1. $\begin{cases} y = x^2 + 3x - 5 \\ y = 3x - 4 \end{cases}$ **(−1, −7), (1, −1)**

2. $\begin{cases} y = -x^2 + 5x - 1 \\ y = -x + 4 \end{cases}$ **(1, 3), (5, −1)**

3. $\begin{cases} y = 2x^2 - x - 5 \\ y = 3x + 1 \end{cases}$ **(−1, −2), (3, 10)**

4. $\begin{cases} y = x^2 + 3x - 7 \\ y = -x - 2 \end{cases}$ **(−5, 3), (1, −3)**

5. $\begin{cases} y = 2x^2 - 5x + 1 \\ y = 5x - 7 \end{cases}$ **(1, −2), (4, 13)**

6. $\begin{cases} y = -x^2 - 2x + 3 \\ y = x - 1 \end{cases}$ **(−4, −5), (1, 0)**

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4-9 Reteaching (continued)

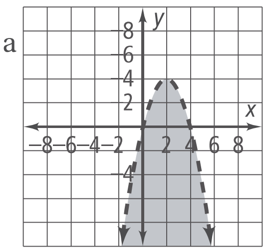
Quadratic Systems

To solve a system of linear inequalities, you graph each inequality and find the region where the graphs overlap. You can also use this technique to solve a system of quadratic inequalities.

Problem

What is the solution of this system of inequalities? $\begin{cases} y < -x^2 + 4x \\ y > x^2 - 2x - 8 \end{cases}$

Step 1 Graph the equation $y = -x^2 + 4x$. Use a dashed boundary line because the points on the curve are not part of the solution. Choose a point on one side of the curve and check if it satisfies the inequality.



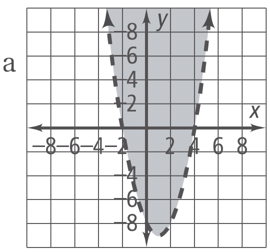
$y < -x^2 + 4x$

$0 \overset{?}{<} -(2)^2 + 4(2)$ Check the point (2, 0).

$0 < 4$ The inequality is true.

Points below the curve satisfy the inequality, so shade that region.

Step 2 Graph the equation $y = x^2 - 2x - 8$. Use a dashed boundary line because the points on the curve are not part of the solution. Choose a point on one side of the curve and check if it satisfies the inequality.



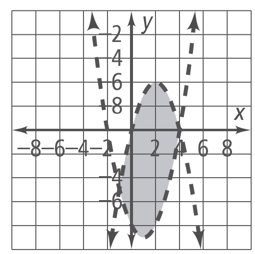
$y > x^2 - 2x - 8$

$0 \overset{?}{>} (2)^2 - 2(2) - 8$ Check the point (2, 0).

$0 > -8$ The inequality is true.

Points above the curve satisfy the inequality, so shade that region.

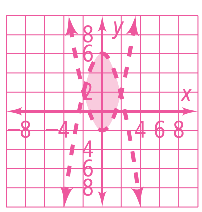
Step 3 The solution to the system of both inequalities is the set of points satisfying both inequalities. In other words, the solution is the region where the graphs overlap. The region contains no boundary points.



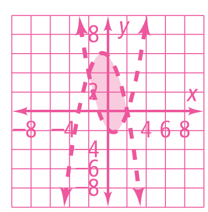
Exercises

Solve each system by graphing.

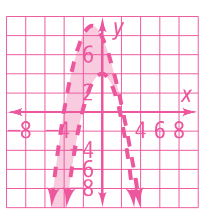
7. $\begin{cases} y < -x^2 + 6 \\ y > x^2 - 2 \end{cases}$



8. $\begin{cases} y > x^2 - x - 2 \\ y < -x^2 - x + 6 \end{cases}$



9. $\begin{cases} y < -x^2 - 2x + 8 \\ y > -x^2 + 4 \end{cases}$



10. $\begin{cases} y > x^2 - 6x \\ y < x^2 - 6x + 7 \end{cases}$