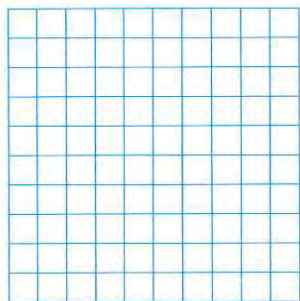


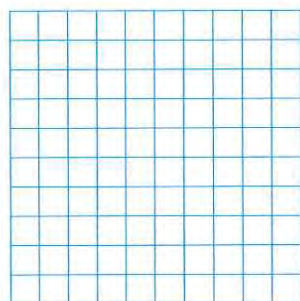
**EXPLORE & REASON**

Draw a rough sketch of a parabola and a line on the coordinate plane.

- A. Count the number of points of intersection between the two graphs.



- B. Sketch another parabola on a coordinate plane. Use a straightedge to investigate the different ways that a line and a parabola intersect. What conjectures can you make?



- C. **Construct Arguments** How many different numbers of intersection points are possible between a quadratic function and a linear function? Justify that you have found all of the possibilities. © MP.3

**HABITS OF MIND**

**Reason** What must be true about the equation for a horizontal line that has no points of intersection with the parabola with equation  $y = x^2$ ? © MP.2

**EXAMPLE 1** **Try It!** Determine the Number of Solutions

1. Determine the number of real solutions of the

system 
$$\begin{cases} y = 3x^2 \\ y = 3x - 2 \end{cases}$$

**EXAMPLE 2** **Try It!** Solve a Linear-Quadratic System Using Substitution

2. Solve each system by substitution.

a. 
$$\begin{cases} y = 2x^2 - 6x - 8 \\ 2x - y = 16 \end{cases}$$

b. 
$$\begin{cases} y = -3x^2 + x + 4 \\ 4x - y = 6 \end{cases}$$

**EXAMPLE 3** **Try It!** Applying a Linear-Quadratic System

3. Revenue for the high school band concert is given by the function
- $y = -30x^2 + 250x$
- , where
- $x$
- is the ticket price, in dollars. The cost of the concert is given by the function
- $y = 490 - 30x$
- . At what ticket price will the band make enough revenue to cover their costs?

**HABITS OF MIND**

**Make Sense and Persevere** Why does the substitution method work? How does it change the problem and make it possible for you to solve? © MP.1



**EXAMPLE 4**  **Try It!** Solve a Linear-Quadratic System of Inequalities

4. Solve the system of inequalities using shading.
- $$\begin{cases} y > x^2 + 6x - 12 \\ 3x - y \geq -8 \end{cases}$$

**EXAMPLE 5**  **Try It!** Using a System to Solve an Equation

5. Solve the equation  $3x^2 - 7x + 4 = 9 - 2x$  by writing a linear-quadratic system and solving using the intersection feature of a graphing calculator.

**HABITS OF MIND**

**Look for Relationships** How could you solve the inequality  $3x + 8 > x^2 + 6x - 2$  graphically? © MP.7



## Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** How can you solve a system of two equations or inequalities in which one is linear and one is quadratic?

2. **Error Analysis** Dyani was asked to use substitution to solve this system:

$$\begin{cases} y = 2x^2 - 6x + 4 \\ x - y = 7 \end{cases}$$

She began as follows, to find the  $x$ -coordinate(s) to the solution(s) of the system:

$x + 2x^2 - 6x + 4 = 7$	Substitute for $y$ .
$2x^2 - 5x - 3 = 0$	Simplify.
$(2x + 1)(x - 3) = 0$	Factor.
$x = -\frac{1}{2}, x = 3$	Set each factor equal to 0, solve for $x$ .

But Dyani has already made an error. What was her mistake? © MP.3

## Do You KNOW HOW?

Determine the number of solutions for the system of equations.

3. 
$$\begin{cases} y = \frac{2}{5}x^2 \\ y = x - 2 \end{cases}$$

4. 
$$\begin{cases} y = -x - 1 \\ 3x^2 + 2y = 4 \end{cases}$$

Use substitution to solve the system of equations.

5. 
$$\begin{cases} y = 3x^2 + 7x - 10 \\ y - 19x = 22 \end{cases}$$

6. 
$$\begin{cases} y = 3x^2 \\ y - 3x = -2 \end{cases}$$