▶ **ACTIVITY 9.6**

Developing Concepts

Investigating Applications of the Discriminant

GROUP ACTIVITY
Work in a small group.

MATERIALS
• graph paper
• graphing calculator (optional)

▶ **QUESTION** How can you determine the number of solutions of a quadratic equation?

▶ **EXPLORING THE CONCEPT**

In Lesson 9.4 you learned that the solutions of a quadratic equation $ax^2 + bx + c = 0$ are the *x*-intercepts of the graph of the related function $y = ax^2 + bx + c$.

1 Begin with the equation $x^2 + 3x - 2 = 0$. Graph the related function $y = x^2 + 3x - 2$.

2 How many *x*-intercepts does your graph have?

3 How many solutions does the equation $x^2 + 3x - 2 = 0$ have?

4 Repeat **Steps 1–3** for each of the following equations.

$$x^2 - 6x + 9 = 0$$

$$x^2 + 3 = 0$$

5 Compare the graphs you have drawn. How many intercepts did you find?
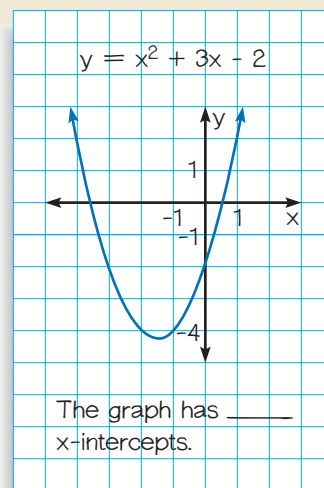
The graph has ____ x-intercepts.

▶ **DRAWING CONCLUSIONS**

In Exercises 1–9, begin with the given quadratic equation. Follow Steps 1–3 for each equation.

1. $9x^2 - 24x + 16 = 0$ **2.** $2x^2 - 5x - 4 = 0$ **3.** $3x^2 - x + 2 = 0$

4. $-x^2 - 4x + 3 = 0$ **5.** $-5x^2 - 5x - 12 = 0$ **6.** $-2x^2 - 4x - 2 = 0$

7. $4x^2 + 8x - 2 = 0$ **8.** $-6x^2 + 2x - \frac{1}{2} = 0$ **9.** $x^2 + 2x - 1 = 0$

10. Compare your results in Exercises 1–9 with those of others in your group. How are the graphs alike? How are they different? How many intercepts did you find? How are the parabolas positioned with respect to the *x*-axis?

11. Each of the equations in Exercises 1–9 is in the form $ax^2 + bx + c = 0$. For each equation, calculate the value of $b^2 - 4ac$. Write the value next to the sketch of the related graph.

12. **CRITICAL THINKING** Use your results of Exercises 1–11 to write a rule that relates the number of solutions of a quadratic equation to the value of $b^2 - 4ac$.