4.9 Graph and Solve Quadratic Inequalities

Before	You graphed and solved linear inequalities.
Now	You will graph and solve quadratic inequalities.
Why?	So you can model the strength of a rope, as in Example 2.

Key Vocabulary
- quadratic inequality in two variables
- quadratic inequality in one variable

A **quadratic inequality in two variables** can be written in one of the following forms:

$$y < ax^2 + bx + c \qquad y \le ax^2 + bx + c \qquad y > ax^2 + bx + c \qquad y \ge ax^2 + bx + c$$

The graph of any such inequality consists of all solutions (x, y) of the inequality.

KEY CONCEPT   *For Your Notebook*

Graphing a Quadratic Inequality in Two Variables

To graph a quadratic inequality in one of the forms above, follow these steps:

STEP 1   **Graph** the parabola with equation $y = ax^2 + bx + c$. Make the parabola *dashed* for inequalities with < or > and *solid* for inequalities with ≤ or ≥.

STEP 2   **Test** a point (x, y) inside the parabola to determine whether the point is a solution of the inequality.

STEP 3   **Shade** the region inside the parabola if the point from Step 2 is a solution. Shade the region outside the parabola if it is not a solution.

EXAMPLE 1   Graph a quadratic inequality

Graph $y > x^2 + 3x - 4$.

Solution

AVOID ERRORS
Be sure to use a dashed parabola if the symbol is > or < and a solid parabola if the symbol is ≥ or ≤.
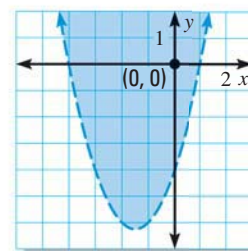
STEP 1   **Graph** $y = x^2 + 3x - 4$. Because the inequality symbol is >, make the parabola dashed.

STEP 2   **Test** a point inside the parabola, such as (0, 0).

$$y > x^2 + 3x - 4$$
$$0 \overset{?}{>} 0^2 + 3(0) - 4$$
$$0 > -4 \checkmark$$

So, (0, 0) is a solution of the inequality.

STEP 3   **Shade** the region inside the parabola.

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