EXAMPLE 2 **Use a quadratic inequality in real life**

RAPPELLING A manila rope used for rappelling down a cliff can safely support a weight W (in pounds) provided
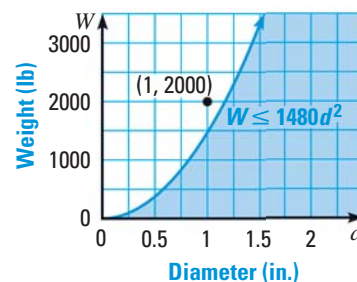
$$W \le 1480d^2$$

where d is the rope's diameter (in inches). Graph the inequality.

Solution

Graph $W = 1480d^2$ for nonnegative values of d. Because the inequality symbol is $\le$, make the parabola solid. Test a point inside the parabola, such as (1, 2000).

$$W \le 1480d^2$$

$$2000 \overset{?}{\le} 1480(1)^2$$

$$2000 \le 1480 \ \text{✗}$$

Because (1, 2000) is not a solution, shade the region below the parabola.

SYSTEMS OF QUADRATIC INEQUALITIES Graphing a *system* of quadratic inequalities is similar to graphing a system of linear inequalities. First graph each inequality in the system. Then identify the region in the coordinate plane common to all of the graphs. This region is called the *graph of the system*.

EXAMPLE 3 **Graph a system of quadratic inequalities**
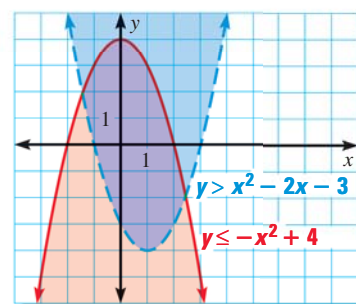
Graph the system of quadratic inequalities.

$$y \le -x^2 + 4 \qquad \textbf{Inequality 1}$$
$$y > x^2 - 2x - 3 \qquad \textbf{Inequality 2}$$

Solution

STEP 1 **Graph** $y \le -x^2 + 4$. The graph is the red region inside and including the parabola $y = -x^2 + 4$.

STEP 2 **Graph** $y > x^2 - 2x - 3$. The graph is the blue region inside (but not including) the parabola $y = x^2 - 2x - 3$.

STEP 3 **Identify** the **purple region** where the two graphs overlap. This region is the graph of the system.

✓ **GUIDED PRACTICE** for Examples 1, 2, and 3

Graph the inequality.

1. $y > x^2 + 2x - 8$ **2.** $y \le 2x^2 - 3x + 1$ **3.** $y < -x^2 + 4x + 2$

4. Graph the system of inequalities consisting of $y \ge x^2$ and $y < -x^2 + 5$.