ONE-VARIABLE INEQUALITIES A **quadratic inequality in one variable** can be written in one of the following forms:

$ax^2 + bx + c < 0$ $\quad ax^2 + bx + c \leq 0$ $\quad ax^2 + bx + c > 0$ $\quad ax^2 + bx + c \geq 0$

You can solve quadratic inequalities using tables, graphs, or algebraic methods.

EXAMPLE 4 Solve a quadratic inequality using a table

Solve $x^2 + x \leq 6$ using a table.

Solution

Rewrite the inequality as $x^2 + x - 6 \leq 0$. Then make a table of values.

MAKE A TABLE
To give the exact solution, your table needs to include the x-values for which the value of the quadratic expression is 0.

x	-5	-4	-3	-2	-1	0	1	2	3	4
$x^2 + x - 6$	14	6	0	-4	-6	-6	-4	0	6	14

Notice that $x^2 + x - 6 \leq 0$ when the values of x are between -3 and 2, inclusive.

▶ The solution of the inequality is $-3 \leq x \leq 2$.

GRAPHING TO SOLVE INEQUALITIES Another way to solve $ax^2 + bx + c < 0$ is to first graph the related function $y = ax^2 + bx + c$. Then, because the inequality symbol is $<$, identify the x-values for which the graph lies *below* the x-axis. You can use a similar procedure to solve quadratic inequalities that involve $\leq$, $>$, or $\geq$.

EXAMPLE 5 Solve a quadratic inequality by graphing

Solve $2x^2 + x - 4 \geq 0$ by graphing.

Solution

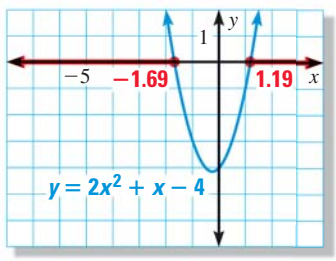
The solution consists of the x-values for which the graph of $y = 2x^2 + x - 4$ lies on or above the x-axis. Find the graph's x-intercepts by letting $y = 0$ and using the quadratic formula to solve for x.

$$0 = 2x^2 + x - 4$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(2)(-4)}}{2(2)}$$

$$x = \frac{-1 \pm \sqrt{33}}{4}$$

$$x \approx 1.19 \text{ or } x \approx -1.69$$



Sketch a parabola that opens up and has 1.19 and -1.69 as x-intercepts. The graph lies on or above the x-axis to the left of (and including) $x = -1.69$ and to the right of (and including) $x = 1.19$.

▶ The solution of the inequality is approximately $x \leq -1.69$ or $x \geq 1.19$.

✓ GUIDED PRACTICE for Examples 4 and 5

5. Solve the inequality $2x^2 + 2x \leq 3$ using a table and using a graph.