4.8 Use the Quadratic Formula and the Discriminant

2A.8.A, 2A.8.B, 2A.8.C, 2A.8.D

Before	You solved quadratic equations by completing the square.
Now	You will solve quadratic equations using the quadratic formula.
Why?	So you can model the heights of thrown objects, as in Example 5.

Key Vocabulary
• quadratic formula
• discriminant

In Lesson 4.7, you solved quadratic equations by completing the square for *each equation separately*. By completing the square *once* for the general equation $ax^2 + bx + c = 0$, you can develop a formula that gives the solutions of *any* quadratic equation. (See Exercise 67.) The formula for the solutions is called the **quadratic formula**.

KEY CONCEPT
For Your Notebook

The Quadratic Formula

Let a, b, and c be real numbers such that $a \neq 0$. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

EXAMPLE 1 Solve an equation with two real solutions

Solve $x^2 + 3x = 2$.

AVOID ERRORS
Remember to write the quadratic equation in standard form before applying the quadratic formula.

$$x^2 + 3x = 2 \qquad \text{Write original equation.}$$

$$x^2 + 3x - 2 = 0 \qquad \text{Write in standard form.}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad \text{Quadratic formula}$$

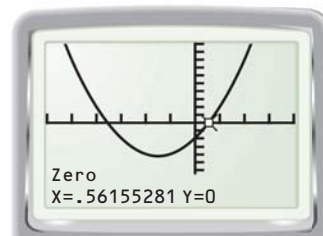$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-2)}}{2(1)} \qquad a = 1, b = 3, c = -2$$

$$x = \frac{-3 \pm \sqrt{17}}{2} \qquad \text{Simplify.}$$

▶ The solutions are $x = \dfrac{-3 + \sqrt{17}}{2} \approx 0.56$ and $x = \dfrac{-3 - \sqrt{17}}{2} \approx -3.56$.

CHECK Graph $y = x^2 + 3x - 2$ and note that the x-intercepts are about 0.56 and about -3.56. ✓


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Zero
X=.56155281 Y=0
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