

9.6 Quadratic Equation

GOAL Solve quadratic equations using the quadratic formula.

Vocabulary

By completing the square for the quadratic equation $ax^2 + bx + c = 0$, you can develop a formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, that gives the solutions of any quadratic equation in standard form. This formula is called the **quadratic formula**.

Common Student Errors

- Arithmetic errors when using quadratic formula

Tip Suggest students write out the values of a , b , and c and to always check their solutions algebraically or graphically.

- Forgetting the quadratic formula

Tip To help students memorize the quadratic formula, for each exercise, have them write out the formula before substituting the values for a , b , and c .

Example: Solve $2x^2 - 7x + 4 = 0$.

Student solution:

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(4)}}{2(2)} = 7 \pm \frac{\sqrt{17}}{4}$$

Memorizing this verbal statement may help:

“The opposite of b , plus or minus the square root of b squared minus $4ac$, all divided by $2a$.”

EXAMPLE 1 Solve a quadratic equation

Solve $5x^2 - 3 = 4x$.

Solution

$$5x^2 - 3 = 4x$$

Write original equation.

$$5x^2 - 4x - 3 = 0$$

Write in standard form.

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

Quadratic formula

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-3)}}{2(5)}$$

Substitute values in the quadratic formula:
 $a = 5$, $b = -4$, and $c = -3$.

$$= \frac{4 \pm \sqrt{76}}{10}$$

Simplify.

The solutions are $\frac{4 + \sqrt{76}}{10} \approx 1.27$ and $\frac{4 - \sqrt{76}}{10} \approx -0.47$.

Exercises for Example 1

Use the quadratic formula to solve the equation. Round your solutions to the nearest hundredth, if necessary.

1. $x^2 - 12x - 14 = 0$

2. $5y^2 - 7 = 11y$

3. $9z^2 + 3z = 5$