

# The Quadratic Formula (Pages 483–487)

You can use the Quadratic Formula to solve any quadratic equation involving any variable.

<b>The Quadratic Formula</b>	The solutions of a quadratic equation in the form $ax^2 + bx + c = 0$ , where $a \neq 0$ , are given by the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .
------------------------------	--

## EXAMPLES

Use the Quadratic Formula to solve each equation.

**A**  $x^2 - 3x - 5 = 0$

In the equation  $x^2 - 3x - 5 = 0$ ,  $a = 1$ ,  $b = -3$ , and  $c = -5$ .

Substitute these values into the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \left| \quad x = \frac{3 \pm \sqrt{9 + 20}}{2}$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-5)}}{2(1)} \quad \left| \quad x = \frac{3 \pm \sqrt{29}}{2}$$

The solution is therefore  $x = \frac{3 \pm \sqrt{29}}{2}$ .

**B**  $-2x^2 + 4x - 6 = 0$

In the equation  $-2x^2 + 4x - 6 = 0$ ,  $a = -2$ ,  $b = 4$ , and  $c = -6$ .

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \left| \quad x = \frac{-4 \pm \sqrt{16 - 48}}{-4}$$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(-2)(-6)}}{2(-2)} \quad \left| \quad x = \frac{-4 \pm \sqrt{-32}}{-4}$$

The square root of a negative number is not a real number. So, there are no real solutions for  $x$ .

## PRACTICE

Use the Quadratic Formula to solve each equation.

- |                         |                          |                          |
|-------------------------|--------------------------|--------------------------|
| 1. $x^2 + 6x + 8 = 0$   | 2. $n^2 - 12n + 32 = 0$  | 3. $c^2 + 4c + 8 = 0$    |
| 4. $p^2 + 4p - 5 = 0$   | 5. $d^2 - 2d - 15 = 0$   | 6. $5h^2 + 4h + 4 = 0$   |
| 7. $3e^2 + 3e - 6 = 0$  | 8. $2m^2 + 8m + 6 = 0$   | 9. $g^2 - 3g + 2 = 0$    |
| 10. $4k^2 + 2k + 3 = 0$ | 11. $3f^2 - 11f - 4 = 0$ | 12. $4v^2 + 12v + 8 = 0$ |
| 13. $x^2 - 12x = -27$   | 14. $3x^2 + 7x = 1$      | 15. $3x - 1 = -x^2$      |
| 16. $2x^2 + 2x = -5$    | 17. $x^2 = 5x - 4$       | 18. $2x^2 + 6 = 3x$      |



- 19. Standardized Test Practice** For a certain quadratic equation, the value of  $b^2 - 4ac$  is  $-8$ . How many real number roots does the equation have?

- A** 3 roots      **B** 2 roots      **C** 1 root      **D** 0 roots

**Answers:** 1.  $-4, -2$  2.  $4, 8$  3. no real solutions 4.  $-5, 1$  5.  $-3, 5$  6. no real solutions 7.  $-2, 1$  8.  $-3, -1$  9.  $1, 2$   
 10. no real solutions 11.  $-\frac{3}{1}, 4$  12.  $-2, -1$  13.  $3, 9$  14.  $\frac{-7 \pm \sqrt{61}}{2}$  15.  $\frac{-3 \pm \sqrt{13}}{2}$  16. no real solutions 17.  $1, 4$  18. no real solutions 19. D