

10.6

Solve Quadratic Equations by the Quadratic Formula

GOAL: Solve a quadratic equation by using the quadratic formula

Quadratic Formula

To solve any quadratic equation of the form $ax^2 + bx + c = 0$, use the quadratic formula for x .

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

- Be sure the equation is written as $ax^2 + bx + c = 0$.
- Identify the values for a , b , & c .
- Plug these values into the quadratic formula & evaluate to solve for x .

EXAMPLES – Solve by the quadratic formula:

1.) $2x^2 - 4 = 3x$

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

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

$$x = \frac{3 \pm \sqrt{41}}{4}$$

$$x = \frac{3 \pm 6.40}{4}$$

$$x = \frac{(3+6.40)}{4} = \boxed{2.35} \quad x = \frac{3-6.40}{4} = \boxed{-0.85}$$

3.) $x^2 + 4x + 1 = 0$

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

$$x = \frac{-4 \pm \sqrt{4}}{2}$$

$$x = \frac{-4 \pm 2}{2}$$

$$\boxed{x = -1}$$

-0.27

$$x = \frac{-4 - 2}{2}$$

$$\boxed{x = -3}$$

 $x = -3.73$

2.) $2x^2 + x = 3$ $2x^2 + x - 3 = 0$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{-1 \pm \sqrt{25}}{4}$$

$$x = \frac{-1 \pm 5}{4}$$

$$x = \frac{-1+5}{4} = \boxed{1}$$

$$x = \frac{-1-5}{4} = \boxed{-1.5}$$

4.) $6x^2 + 7x - 3 = 0$

$$x = \frac{-7 \pm \sqrt{(7)^2 - 4(6)(-3)}}{2(6)}$$

$$x = \frac{-7 \pm \sqrt{121}}{12}$$

$$x = \frac{-7 \pm 11}{12}$$

$$x = \frac{-7+11}{12} = \boxed{0.33}$$

$$x = \frac{-7-11}{12} = \boxed{-1.5}$$

LESSON 10.6 Practice A

Name _____

Identify the values of a , b , and c in the quadratic equation.

1. $5x^2 + 7x + 1 = 0$

$a=5, b=7, c=1$

3. $17x - 23 = x^2 \quad x^2 - 17x + 23 = 0$

$a=1, b=-17, c=23$

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

$a=-3, b=0, c=-2$

2. $2x^2 - 6x + 11 = 0$

$a=2, b=-6, c=11$

4. $10x^2 - 13 = 8x \quad 10x^2 - 8x - 13 = 0$

$a=10, b=-8, c=-13$

6. $5x^2 - 18x = 0$

$a=5, b=-18, c=0$

Match the quadratic equation with the formula that gives its solution(s).

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

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

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

7. $2x^2 + x - 4 = 0$ **B**

8. $4x^2 - x + 2 = 0$ **C**

9. $-x^2 + 4x + 2 = 0$ **A**

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

10. $x^2 + 6x - 10 = 0$

$x = \frac{-6 \pm \sqrt{(6)^2 - 4(1)(-10)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{76}}{2} = \frac{-6 \pm 8.72}{2}$

$x = 1.36 \quad x = -7.36$

11. $x^2 - 4x - 9 = 0$

$x = \frac{4 \pm \sqrt{52}}{2}$

$x = 4 \pm 7.21$

$x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(-9)}}{2(1)}$

$x = 5.60$
 $x = -1.60$

10. $5x^2 - 3 = -2x \quad 5x^2 + 2x - 3 = 0$

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

$x = \frac{-2 \pm 8}{10}$

$x = \frac{-2 \pm \sqrt{64}}{10}$

$x = 0.60 \quad x = -1$

11. $2x^2 - 3x = -5 \quad 2x^2 - 3x + 5 = 0$

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

$x = \frac{3 \pm \sqrt{31}}{4}$

No Solution!

12. $10x + 1 = -x^2 \quad x^2 + 10x + 1 = 0$

$x = \frac{-10 \pm \sqrt{10^2 - 4(1)(1)}}{2(1)}$

$x = \frac{-10 \pm \sqrt{96}}{2}$

$x = \frac{-10 \pm 9.80}{2}$

$x = -0.1$
 $x = -9.9$

13. $3x^2 - 2 = 0 \quad a=3, b=0, c=-2$

$x = \frac{0 \pm \sqrt{0^2 - 4(3)(-2)}}{2(3)}$

$x = \frac{0 \pm \sqrt{24}}{6}$

$x = \pm \frac{4.90}{6}$

$x = 0.82 \quad x = -0.82$