

Quadratic Formula

The Quadratic Formula

For a quadratic equation in standard form
 $ax^2 + bx + c = 0$

Example 3:

$$x^2 - 10x = -24$$

$$x^2 - 10x + 24 = 0$$

$$\left. \begin{array}{l} a = 1 \quad b = -10 \\ c = 24 \end{array} \right\}$$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(24)}}{2(1)}$$

$$x = \frac{10 \pm \sqrt{4}}{2} \rightarrow x = \frac{10 \pm 2}{2}$$

$$x = \frac{8}{2}, \frac{12}{2}$$

$$\boxed{x = 4, 6}$$

The quadratic formula is a sure way to solve a quadratic equation. It will always work! You first have to be sure to get the quadratic equation in standard form, $= 0$.

The roots for $ax^2 + bx + c = 0$ are

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

Note: These really are two equations - one with $-b + \sqrt{\dots}$ and one with

$-b - \sqrt{\dots}$

Example: Solve the equation using the quadratic formula.

$$x^2 - 3x - 7 = 0$$

$$a = 1 \quad b = -3 \quad c = -7$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-7)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{37}}{2}$$

Roots/Solutions:

$$x = \frac{3 + \sqrt{37}}{2}$$

$$x = \frac{3 - \sqrt{37}}{2}$$

Example: Solve the equation using the quadratic formula.

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

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

$$a = 3 \quad b = -4 \quad c = -3$$

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

$$x = \frac{4 \pm \sqrt{52}}{6}$$

$$x = \frac{4 \pm 2\sqrt{13}}{6}$$

$$x = \frac{2 \pm \sqrt{13}}{3}$$

QF Practice

YOU TRY - QUADRATIC FORMULA

Use the quadratic formula to solve for x in the following quadratic equations.

1. $y = 2x^2 - 11x + 12$

$$a = 2 \quad b = -11 \quad c = 12$$

$$x = 4, \frac{3}{2}$$

2. $y = x^2 + 5x - 10$

$$x = \frac{-5 \pm \sqrt{65}}{2}$$

3. $y = -x^2 + 4x + 30$

$$x = 2 \pm \sqrt{34}$$

4. $y = 9x^2 - 6x + 1$

$$x = \frac{1}{3}$$

5. $y = x^2 - 7$

$$x = \pm \sqrt{7}$$

6. $y = x^2 + 7x - 33$

$$x = \frac{-7 \pm \sqrt{181}}{2}$$

7. $y = 4x^2 - 28x + 49$

$$x = \frac{7}{2}$$

8. $y = 2x^2 - 5x$

$$x = \frac{5}{2} \quad x = 0$$

You Try- Quadratic Formula

Use the quadratic formula to solve for x in the following quadratic equations.

1. $y = 2x^2 - 11x + 12$

$a = 2$ $b = -11$ $c = 12$

$$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(2)(12)}}{2(2)}$$

$$x = \frac{11 \pm \sqrt{25}}{4}$$

$$x = \frac{11 \pm 5}{4}$$

$$x = 4, \frac{3}{2}$$

3. $y = -x^2 + 4x + 30$

$a = -1$ $b = 4$ $c = 30$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(-1)(30)}}{2(-1)}$$

$$x = -4 \pm \sqrt{136}$$

$$x = -4 \pm 2\sqrt{34}$$

5. $y = x^2 + 0x - 7$

$a = 1$ $b = 0$ $c = -7$

$$x = \pm 2\sqrt{34}$$

$$x = \frac{-0 \pm \sqrt{0^2 - 4(1)(-7)}}{2(1)}$$

$$x = \pm \frac{\sqrt{28}}{2}$$

$$x = \pm \frac{2\sqrt{7}}{2}$$

$$x = \pm \sqrt{7}$$

7. $y = 4x^2 - 28x + 49$

$a = 4$ $b = -28$ $c = 49$

$$x = \frac{-(-28) \pm \sqrt{(-28)^2 - 4(4)(49)}}{2(4)}$$

$$x = \frac{28 \pm 0}{8}$$

$$x = \pm \frac{7}{2}$$

2. $y = x^2 + 5x - 10$

$a = 1$ $b = 5$ $c = -10$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-10)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{65}}{2}$$

4. $y = 9x^2 - 6x + 1$

$a = 9$ $b = -6$ $c = 1$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(9)(1)}}{2(9)}$$

$$x = \frac{6 \pm \sqrt{0}}{18}$$

$$x = \pm \frac{1}{3}$$

6. $y = x^2 + 7x - 33$

$a = 1$ $b = 7$ $c = -33$

$$x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-33)}}{2(1)}$$

$$x = \frac{-7 \pm \sqrt{181}}{2}$$

8. $y = 2x^2 - 5x + 0$

$a = 2$ $b = -5$ $c = 0$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(0)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25}}{4}$$

$$x = \frac{5+5}{4} \text{ or } \frac{5-5}{4}$$

$$x = \frac{5}{2} \text{ or } x = 0$$