

Use the Quadratic Formula to Solve Quadratic Equations

Example 1 Solve the equation $x^2 + 3x - 4 = 0$ by using the quadratic formula

Solution $x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ for $ax^2 + bx + c = 0$

Plug in the values for a, b, and c into the quadratic formula above, in order to solve for x. In our case $a = 1$, $b = 3$, and $c = -4$.

$$x_{1,2} = \frac{-3 \pm \sqrt{3^2 - 4(1)(-4)}}{2(1)} = \frac{-3 \pm \sqrt{9+16}}{2} = \frac{-3 \pm \sqrt{25}}{2} = \frac{-3 \pm 5}{2}$$

$$x_1 = 1 \quad x_2 = -4$$

PROBLEMS Solve the equation by using the quadratic formula.

1. $x^2 + 7x + 12 = 0$
 $a = 1$
 $b = 7$
 $c = 12$

$$x = \frac{-7 \pm \sqrt{49 - (4 \cdot 1 \cdot 12)}}{2} = \frac{-7 \pm \sqrt{49 - 48}}{2} = \frac{-7 \pm 1}{2}$$

$$= (-4, -3)$$

2. $x^2 - 8x + 12 = 0$
 $a = 1$
 $b = -8$
 $c = 12$

$$x = \frac{-8 \pm \sqrt{64 - 48}}{2} = \frac{-8 \pm \sqrt{16}}{2} = \frac{-8 \pm 4}{2} = (-6, -2)$$

3. $x^2 - x - 2 = 0$
 $a = 1$
 $b = -1$
 $c = -2$

$$x = \frac{1 \pm \sqrt{1 - (-8)}}{2} = \frac{1 \pm 3}{2} = (, 2)$$

4. $-2x^2 + 4x + 8 = 0$
 $a = -2$
 $b = 4$
 $c = 8$

$$x = \frac{-4 \pm \sqrt{16 + 64}}{-4} = \frac{-4 \pm \sqrt{80}}{-4} = \frac{-4 \pm 4\sqrt{5}}{-4} = (1 \pm \sqrt{5})$$

$$= (1 + \sqrt{5}, 1 - \sqrt{5})$$

Example 2 Solve the equation $x^2 + 3x + 10 = 0$ by using the quadratic formula

Solution $x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ for $ax^2 + bx + c = 0$

Plug in the values for a, b, and c into the quadratic formula above, in order to solve for x. In our case $a = 1$, $b = 3$, and $c = 10$.

$$x_{1,2} = \frac{-3 \pm \sqrt{3^2 - 4(1)(10)}}{2(1)} = \frac{-3 \pm \sqrt{9 - 40}}{2} = \frac{-3 \pm \sqrt{-31}}{2} = \frac{-3 \pm \sqrt{31} \cdot \sqrt{-1}}{2} = \frac{-3 \pm \sqrt{31}i}{2}$$

$$x_1 = -\frac{3}{2} + \frac{\sqrt{31}i}{2} \quad x_2 = -\frac{3}{2} - \frac{\sqrt{31}i}{2}$$



CAN'T TAKE
SQUARE ROOT
OF A NEGATIVE



PROBLEMS Solve the equation by using the quadratic formula.

5. $x^2 + 4x + 8 = 0$

$a = 1$

$b = 4$

$c = 8$

$$x = \frac{-4 \pm \sqrt{16 - 32}}{2} = \frac{-4 \pm \sqrt{-16}}{2}$$

~~$x = \frac{-4 \pm \sqrt{-16}}{2} = \frac{-4 \pm 4i}{2} = -2 \pm 2i$~~

no solution

6. $-3x^2 + x - 2 = 0$

$a = -3$

$b = 1$

$c = -2$

$$x = \frac{-1 \pm \sqrt{1 - 24}}{-6} = \frac{-1 \pm \sqrt{-23}}{-6}$$

~~$x = \frac{-1 \pm \sqrt{-23}}{-6} = \frac{-1 \pm \sqrt{23}i}{-6}$~~

no solution