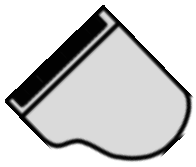
Core Concept

The Quadratic Formula

Let a, b, and c be real numbers such that $a \neq 0$. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Negative *b*, negative *b*
Plus or minus, plus or minus
The square root of *b* squared, minus four *a c*
All over 2*a*, all over 2*a*



Solve $x^2 + 3x = 5$ using the Quadratic Formula.

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

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

$a = 1$
$b = 3$
$c = -5$

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

$x = \frac{-3 \pm \sqrt{9 + 20}}{2} = \frac{-3 \pm \sqrt{29}}{2}$

$x = \frac{-3 \pm \sqrt{29}}{2}$

Solve the equation using the Quadratic Formula.

1. $x^2 - 6x + 4 = 0$ **2.** $2x^2 + 4 = -7x$ **3.** $5x^2 = x + 8$

$a = 1$
$b = -6$
$c = 4$

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

$x = \frac{6 \pm \sqrt{36 - 16}}{2}$

$x = \frac{6 \pm \sqrt{20}}{2}$ $\sqrt{20} = \sqrt{4}\sqrt{5}$

$x = \frac{6 \pm 2\sqrt{5}}{2}$

$x = 3 \pm \sqrt{5}$

$2x^2 + 7x + 4 = 0$

$a = 2$
$b = 7$
$c = 4$

$x = \frac{-7 \pm \sqrt{17}}{4}$

$x = \frac{1 \pm \sqrt{161}}{10}$

Solve $25x^2 - 8x = 12x - 4$ using the Quadratic Formula.

$-12x \quad +4 \quad -12x \quad +4$

$25x^2 - 20x + 4 = 0$

$a = 25$
$b = -20$
$c = 4$

$$x = \frac{20 \pm \sqrt{(-20)^2 - 4(25)(4)}}{2(25)}$$

$$x = \frac{20 \pm \sqrt{400 - 400}}{50} = \frac{20 \pm \sqrt{0}}{50} = \frac{20}{50} = \frac{2}{5}$$

Solve $-x^2 + 4x = 13$ using the Quadratic Formula.

$-x^2 + 4x - 13 = 0$

$a = -1$
$b = 4$
$c = -13$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(-1)(-13)}}{2(-1)}$$

$$x = \frac{-4 \pm \sqrt{16 - 52}}{-2}$$

$$x = \frac{-4 \pm \sqrt{-36}}{-2}$$

$$x = \frac{-4 \pm 6i}{-2} = 2 \pm 3i$$

$\frac{6i}{-2} \quad -3i$

$\frac{-6i}{-2} \quad 3i$

Solve the equation using the Quadratic Formula.

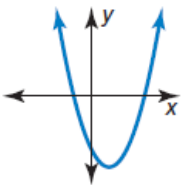
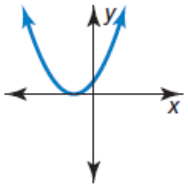
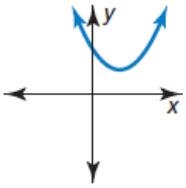
4. $x^2 + 41 = -8x$ **5.** $-9x^2 = 30x + 25$ **6.** $5x - 7x^2 = 3x + 4$

Core Concept

$b^2 - 4ac$

Analyzing the Discriminant of $ax^2 + bx + c = 0$

positive negative

Value of discriminant	$b^2 - 4ac > 0$	$b^2 - 4ac = 0$	$b^2 - 4ac < 0$
Number and type of solutions	Two real solutions	One real solution	Two imaginary solutions
Graph of $y = ax^2 + bx + c$	 Two x-intercepts	 One x-intercept	 No x-intercept

Find the discriminant of the quadratic equation and describe the number and type of solutions of the equation.

$b^2 - 4ac$

a. $x^2 - 6x + 10 = 0$ 2 imag. solutions

$a = 1$
$b = -6$
$c = 10$

$(-6)^2 - 4(1)(10)$
$36 - 40$
-4

b. $x^2 - 6x + 9 = 0$ 1 real solution

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

$(-6)^2 - 4(1)(9)$
$36 - 36$
0

c. $x^2 - 6x + 8 = 0$ 2 real sol.

$a = 1$
$b = -6$
$c = 8$

$(-6)^2 - 4(1)(8)$
$36 - 32$
4