The Quadratic Formula

Clear Learning Target

You will be able to solve quadratic equations using the quadratic formula.

You will be able to determine the number of real roots of a quadratic function using the discriminant.

The Quadratic Formula

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

*Where do **a**, **b**, and **c** come from?

$$ax^2 + bx + c = 0$$

Example #1: *Solve.* **$x^2 - 12x = -20$**

$+20 \quad +20$

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

1. Move everything to left side: $x^2 - 12x + 20 = 0$
2. Find a, b, & c: $a = 1 \quad b = -12 \quad c = 20$
3. Plug #'s in!: $x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(20)}}{2(1)}$
4. Simplify: $x = \frac{12 \pm \sqrt{64}}{2} = \frac{12 \pm 8}{2}$
5. Split & Solve!: $x = \frac{12+8}{2} = \frac{20}{2} = 10$; $x = \frac{12-8}{2} = \frac{4}{2} = 2$

$x = 10, 2$

You Try! *Solve.* $x^2 - 2x - 15 = 0$

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

$a = 1$

$b = -2$

$c = -15$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-15)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{64}}{2} = \frac{2 \pm 8}{2}$$

$\frac{2+8}{2} = \frac{10}{2} = 5$ $\quad \frac{2-8}{2} = \frac{-6}{2} = -3$

$x = 5, -3$

Word Worth Knowing!

discriminant

the expression under the radical sign, $b^2 - 4ac$

If the discriminant is...	Negative	Zero	Positive
...then there are ____ real roots.	0	1	2

Example #2: *Name the discriminant of the equation, and determine how many real roots the equation has.*

$$4x^2 + 5x = -3$$

$+3 \quad +3$

$4x^2 + 5x + 3 = 0$

$a \quad b \quad c$

$b^2 - 4ac = (5)^2 - 4(4)(3)$

$= 25 - 48 = \boxed{-23}$

Zero real roots!

You Try! *Name the discriminant of the equation, and determine how many real roots the equation has.*

$$9x^2 - 30x + 25 = 0$$

$(-30)^2 - 4(9)(25) = \boxed{0}$

1 real root