Algebra 1

Lesson 9.9 – The Quadratic Formula

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So far, you have learned that a quadratic equation can be solved by graphing, factoring, and square rooting. There is yet another method of factoring called **the Quadratic Formula.** Briefly stated:

- Given a quadratic equation, $ax^2 + bx + c = 0$, the roots or zeros can be found by the formula

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

Example: Solve $x^2 - 2x - 3 = 0$ LOOK OUT FOR NEGATIVE SIGNS!

$the\ coefficients\ of\ the\ terms\ are\colon\ a = 1, b = -2, c = -3$

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

$$\boldsymbol{x = \frac{2 \pm \sqrt{4 + 12)}}{2}}$$

$$\boldsymbol{x = \frac{2 \pm \sqrt{16}}{2}}$$

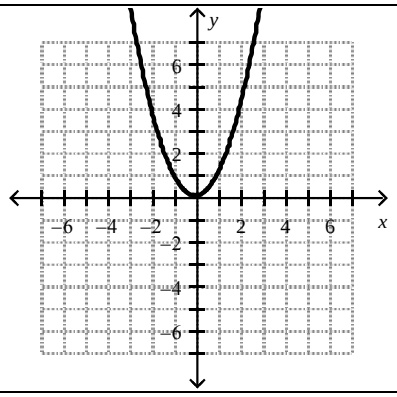
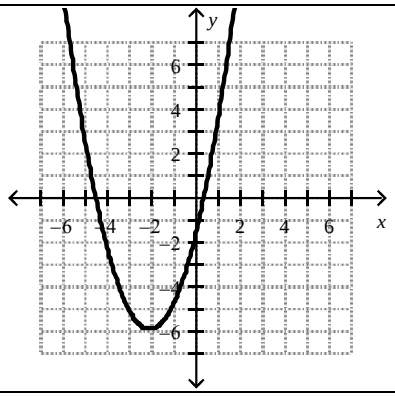
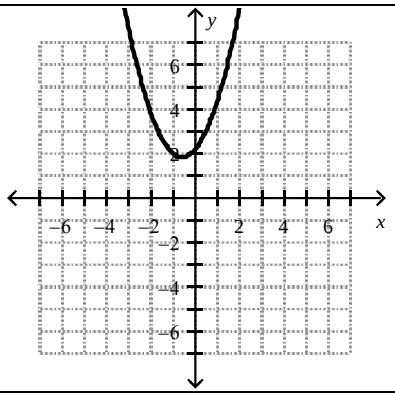
$$\boldsymbol{x = \frac{2 \pm 4}{2}}$$

$$\boldsymbol{x = \frac{2 + 4}{2} = \frac{6}{2} = 3\ \ OR\ x = \frac{2 - 4}{2} = \frac{-2}{2} = -1}$$

Solve using the Quadratic Formula

$-3x^2 + 5x + 2 = 0$	$x^2 + 7x + 10 = 0$	$2x^2 + 4x = 21$

-We have 3 possibilities for solutions. When graphed, we can quickly see the solutions:

1 solution	2 solutions	No *real* solutions
		

What part of the quadratic formula will determine whether we have 1 – 2 – or no real solutions?

The **discriminant** of a quadratic equation is $\boldsymbol{b^2 - 4ac}$. This expressions will help your to determine **how many** and **what kind of roots** a quadratic equation will have.

- If $b^2 - 4ac > 0$, ***positive*** then the quadratic equation will have **TWO** real roots.
- If $b^2 - 4ac = 0$, ***equal to zero*** then the quadratic equation will have **ONE** real root.
- If $b^2 - 4ac < 0$, ***negative*** then the quadratic equation will have **NO** real roots.

Example: How many and what kind of roots does $y = x^2 - 10x + 3$ have?

$b^2 - 4ac = (-10)^2 - 4(1)(3)$ Coefficients: a=1. B=-10, c=3

$= 100 - 12 = \mathbf{88}$ $\mathbf{88} > 0 \therefore$ $2\ real\ roots$

you try:

$x^2 - 9x + 4 = 0$	$2x^2 - 2x + 3 = 0$	$x^2 + 4x + 4 = 0$