Algebra 2

Lesson 5-5: Quadratic Equations

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When solving a quadratic equation: $ax^2 + bx + c = 0$, we are looking for the solutions of $x \text{ when } y = 0$. There several ways we can solve for **x**. One way is through **factoring:**

In the last section, we learned how to factor a quadratic expression. This skill will enable us to find solutions to x algebraically when we use the **Zero-Product Property.**

Zero-Product Property: $If\ ab = 0, then\ a = 0\ or\ b = 0$. (If a product of 2 values equals zero, it stands to reason that one or the other term will have to be equal to zero)

Example: $(x + 4)(x + 8) = 0, then\ (x + 4) = 0\ or\ (x + 8) = 0$ from here we can solve these 2 little equations for x:

$x + 4 = 0 \quad x + 4 - 4 = 0 - 4$ OR $x + 8 = 0 \quad x + 8 - 8 = 0 - 8$

$x = -4 \qquad x = -8$

In the case of a quadratic, both of these x- values are solutions to the equation; they are the points where the parabola will cross the x-axis

Let's put the whole picture together: ARRGH! With a harder problem! (*but good review)*

Example: Solve for x by Factoring:

$x^2 - 7x - 18 = 0$	$2x^2 - 4x = 6$
$3x^2 - 20x - 7 = 0$	$3x^2 = -5x + 12$

$3x^2 + 12x + 12 = 0$	$x^2 - 64 = 0$

Yes, there are some problems that are so simple you may wonder.

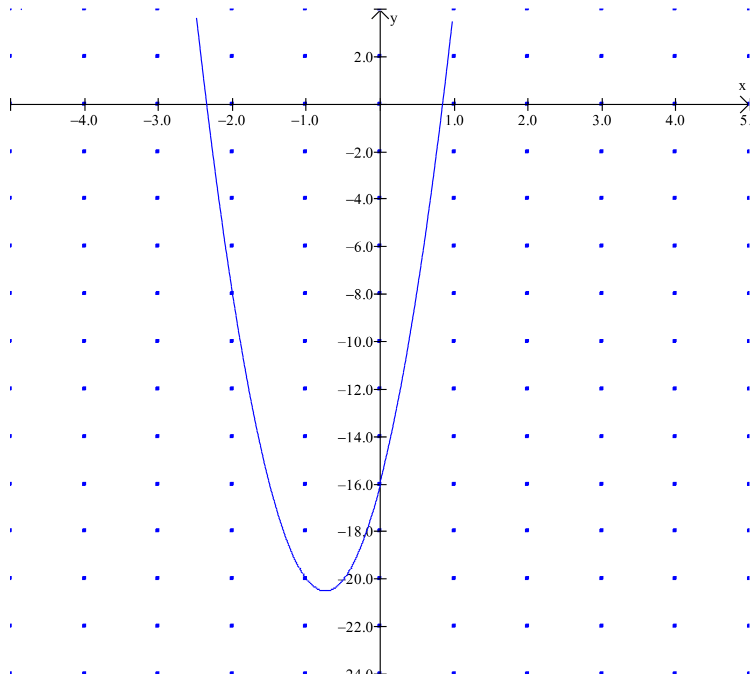
Solve using square roots

$x^2 - 25 = 0$	$3x^2 - 24 = 0$	$3x^2 + 27 = 0$

The tallest building in the world is the Burj Kalifah in Dubai. It stands 2,722 feet tall. The function, $y = -16t^2 + 2722$ models the height in y in feet of an object t seconds after it is dropped from the top of the building. how long will it take the object to hit the ground

GRAPHING

Not every quadratic is factorable. In these cases we can graph the quadratic equation and find the solutions to the equation off the graph.



Example: Using the graphing calculator, graph $8x^2 + 12x - 16 = 0$

What do you see?

That is, where does the parabola cross the x-axis? ANS.: At the x-intercepts! These are the points where y is equal to 0 and are called **zeros of the function** or **the roots of the equation**.

In other words, if we graph the parabola on the calculator then, **2nd TRACE, 2: zero, ENTER**, and follow the directions to identify the left and right bounds WRT the parabola intersecting the x-axis, you will get the zeros for the equation. Note: you will need to do this process twice so to find both **zeros of the function.**

$\boldsymbol{x = -2.35 \ or \ 0.85}$