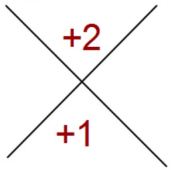
Given this equation: $x^2 + x + 2 = 0$

Can you solve this equation by taking square roots?

No, Square roots can't be used if there is a linear term

Given this equation: $x^2 + x + 2 = 0$

Can you solve this equation by factoring?



No, this doesn't factor. There aren't two integers that multiply to 2 and add to 1

No, this doesn't factor. There are no integers tha

Factoring works SOME of the time.

Using Square Roots works SOME of the time.

Is there anything that works ALL of the time?

Quadratic Formula

Ways to solve Quadratic Equations:

- Factoring ✓
- Square Roots ✓
- Quadratic Formula
- Graphing

Sec 5-8: The Quadratic Formula

Equation must be written in the following form:

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

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

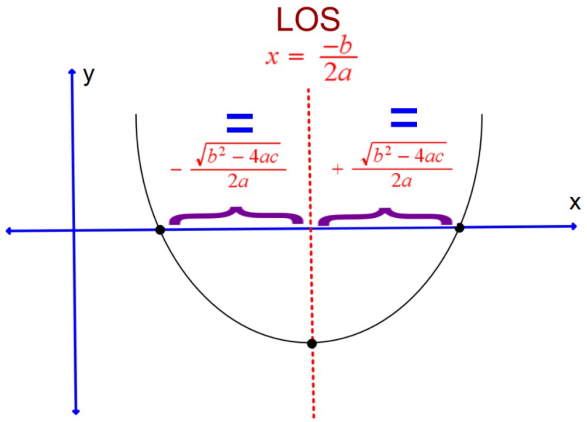
The results of using the Quadratic Fomula represent:

- solutions to the equation
- zeros of the function
- x-intercepts of the graph
- roots of the function

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Can be written as:

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

LOS ?



$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Can be written as:

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

LOS

Distance from LOS to each x-intercept

Find the solutions to this quadratic equation using the Quadratic Formula. Round to the nearest hundredth as necessary.

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

$$6x^2 + 7x - 20 = 0$$

1st: Find $b^2 - 4ac$ = 529

2nd: Rewrite the Quadratic Formula Using this value in place of $b^2 - 4ac$ and replace 2a with its value

$$\frac{-7 \pm \sqrt{529}}{12}$$

3rd: Calculate the two answers

1.33, −2.5

Find the EXACT Solutions.

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

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

$b^2 - 4ac =$ 13

$$x = \frac{5 \pm \sqrt{13}}{2}$$

Find the EXACT Solutions.

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

$$x^2 - 8x - 2 = 0$$

$b^2 - 4ac =$ 72

$$x = \frac{8 \pm \sqrt{72}}{2} \rightarrow \sqrt{36 \cdot 2} = \frac{8 \pm 6\sqrt{2}}{2}$$

$$= 4 \pm 3\sqrt{2}$$

Find both the Exact solutions and solutions rounded to the nearest hundredth. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

$b^2 - 4ac =$ 112

$x = \frac{2 \pm \sqrt{112} \to \sqrt{16 \cdot 7}}{6} = \frac{2 \pm 4\sqrt{7}}{6}$

$= \frac{1 \pm 2\sqrt{7}}{3} \approx 2.10, -1.43$

Find both the Exact solutions and solutions rounded to the nearest hundredth. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x^2 - 4x + 29 = 0$

$b^2 - 4ac =$ -100

NO Real Sol

Find the Exact solutions. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

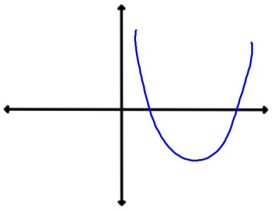
$4x^2 + 20x + 25 = 0$

$b^2 - 4ac =$ 0

$x = \frac{-20 \pm \sqrt{0}}{8} = \frac{-20}{8} = -2.5$

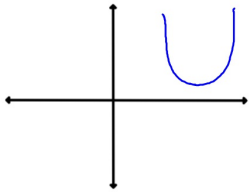
$6x^2 + 7x - 20 = 0$

Two Real Solutions
because there are two square roots of of every positive number.



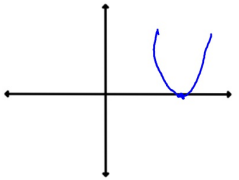
$x^2 - 4x + 29 = 0$

No Real Solutions
because there are no real square roots
of a negative number.



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

One Real Solution
because there is only one square root
of Zero.



Discriminate: recognize a distinction; differentiate

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

What part of the Quadratic Formula
determines if there are Real solutions
or not?

The DISCRIMINANT ⟶ $b^2 - 4ac$

Depending on the value of the DISCRIMINANT
you can determine how many and what kind
of solutions there will be.

Discriminant	# and kind of solutions
b^2 - 4ac > 0	2 Real Solutions
b^2 - 4ac = 0	1 Real Solution
b^2 - 4ac < 0	0 Real Solutions or 2 Imaginary Solutions

How many and what kind of solutions does each quadratic equation have?

1. $x^2 + 8x - 1 = 0$

   $b^2 - 4ac = 68$

   2 Real Solutions

2. $2x^2 - 7x + 8 = 0$

   $b^2 - 4ac = -15$

   No Real Solution or 2 Imaginary Solutions

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

   $b^2 - 4ac = 76$

   2 Real Solutions

4. $2x^2 - 20x + 50 = 0$

   $b^2 - 4ac = 0$

   1 Real Solutions

5. $-4x^2 + 7x - 2 = 0$

   $b^2 - 4ac = 17$

   2 Real Solutions

For some of these equations you can tell that there will be 2 Real solutions without doing anything. Which ones?

whenever EITHER a or c is negative the Discriminant is always positive leading to 2 Real Solutions.

You can now finish Hwk #21

Sec 5-8

Pages 293-294

Problems 8, 9, 21-24, 31-33, 57-59