Solving Quadratic Equations:

Factoring,using Square Roots, and Completing the Square are good methods, BUT:

- Factoring — Not everything is factorable
- Square Roots — Only possible if b=0 or eq. is in Vertex Form.
- Completing the Square — a must be 1 and it's easiest if b is even.

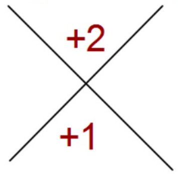
Given this equation: $x^2 + x + 2 = 0$

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 are no integers that multiply to +2 and add to +1

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

Can you solve this by Completing the square?

Yes, but since b is odd it wouldn't be the "easiest" for most people.

- Solving by factoring works only SOME of the time
- Solving using Square Roots works only SOME of the time
- Solving by Completing the Square can work all the time but may not be "easy".
- Solving by graphing works all the time if you have the technology, but, doesn't always give EXACT solutions.
- Using the Quadratic Formula ALWAYS works.

Section 5-8: The Quadratic Formula.

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

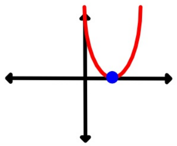
Sec 5-8: To solve using Quadratic Formula

Equation must be written in the following form:

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

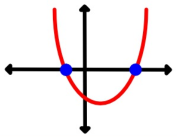
# of Real solutions to a Quadratic Equation. (same as # x-intercepts on the graph)

1 Real Solution



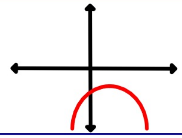
Only the vertex touches the x-axis

2 Real Solutions



The parabola crosses the x-axis in two places

No Real Solution



The parabola doesn't touch the x-axis

The results of using the Quadratic Fomula represent:

- solutions to the equation
- zeros of the function
- x-intercepts of the graph (only real solutions)
- roots of the function

Find all real solutions to the nearest hundredth.

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

$$-5x^2 - 12x + 13 = 0$$

1st: Find $b^2 - 4ac = 404$

2nd: Rewrite the Quadratic Formula Using this value in place of b^2 - 4ac and replacing -b & 2a with their values

$$\frac{12 \pm \sqrt{404}}{-10}$$

3rd: Calculate the two answers

x= -3.21, 0.81

Find all EXACT Real Solutions.

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

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

$$-5x \quad -5x$$

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

$b^2 - 4ac = 13$

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

this doesn't simplify any further

Find all EXACT Complex Solutions.

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

$$3x^2 - 2x + 8 = 0$$

$b^2 - 4ac = -92$

$$x = \frac{2 \pm \sqrt{-92} \rightarrow 4.23}{6}$$

$$x = \frac{2 \pm 2i\sqrt{23}}{6}$$

reduce by GCF of 2

$$x = \frac{1 \pm i\sqrt{23}}{3}$$

Find all EXACT Complex Solutions.

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

$$4x^2 - 20x + 7 = 0$$

$b^2 - 4ac = 288$

$$x = \frac{20 \pm \sqrt{288}}{8} \Rightarrow \sqrt{144 \cdot 2}$$

$$x = \frac{20 \pm 12\sqrt{2}}{8}$$

reduce by GCF of 4

$$\boxed{x = \frac{5 \pm 3\sqrt{2}}{2}}$$

Find all Complex Solutions. Round real solutions to the nearest hundredth. For imaginary solutions give EXACT answers.

$$16x^2 - 56x + 49 = 0$$

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

$b^2 - 4ac = 0$

$$x = \frac{56 \pm \sqrt{0}}{32}$$

$$= \frac{56}{32}$$

$$\boxed{x = 1.75}$$

You can now finish Hwk #18

Sec 5-8

Due Tomorrow

Page 293

Problems: 6, 8, 9, 23, 26, 27

EXACT solutions

EXACT & Rounded solutions

A ball is thrown into the air from an initial height of 25 feet with an initial velocity of 88 ft/sec. The following equation models the height of the ball as a function of time: $h(t) = -16t^2 + 88t + 25$

Find the time it takes the ball to come back down to the ground to the nearest hundredth.

$h = 0$

$$0 = -16t^2 + 88t + 25$$

$$b^2 - 4ac = 9344$$

$$t = \frac{-88 \pm \sqrt{9344}}{-32}$$

$$t = -0.27 \text{ \& } 5.77$$

In this situation negative time has no real meaning. The only answer is the positive quantity.

$$\boxed{t = 5.77 \text{ sec}}$$