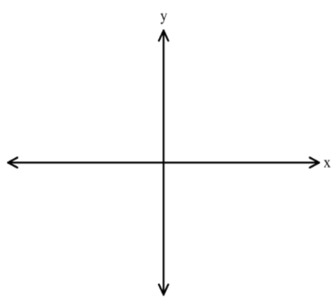
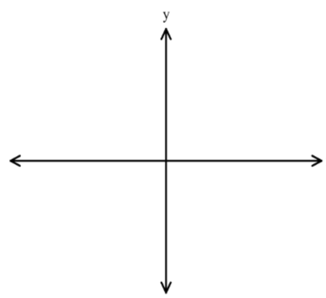
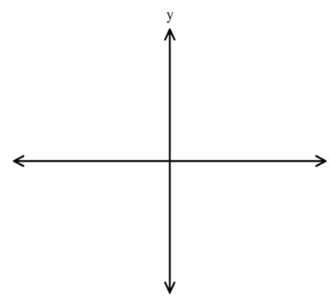
10.1 Notes: Solving Quadratics by Square Rooting

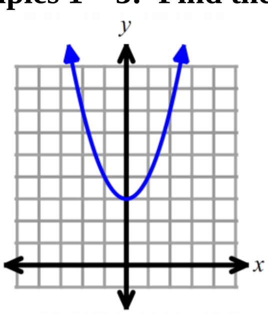
Objectives:

- Solve quadratic equations by square rooting.
- Determine when a quadratic equation has no solution.

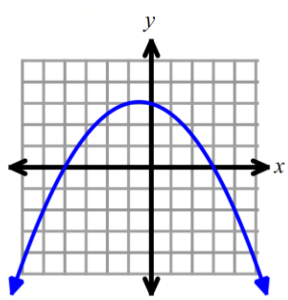
Quadratic Expression	
Quadratic Equation	
Quadratic Function	**Note: we will learn how to graph quadratic functions in Chapter 11.**
Solutions of a Quadratic Function	**Solutions of a quadratic function are the ____ -intercepts.** We can have _______ solution, _______ solution, or _______ solutions.   

Examples 1 – 3: Find the solution(s), if any, of the quadratic functions that are graphed below.

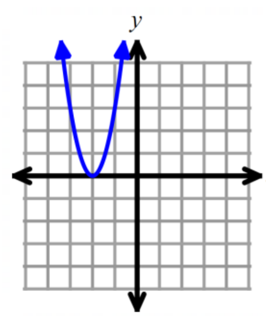
1)



2)



3)



Alternate Terms for "x –intercepts"	
Solving a Quadratic Equation by Square Rooting	**Note:** When a variable^2 or ( )^2 is isolated, it **cannot** equal a **negative** number. If it does, then there is NO solution.

Examples #1 – 6: Solve each equation for the variable by square rooting.

1) $z^2 - 5 = 4$

2) $r^2 + 7 = 4$

3) $4x^2 + 3 = 3$

You Try #4 – 6!

4) $-3x^2 + 4 = -23$

5) $4t^2 + 17 = 17$

6) $p^2 + 8 = 0$

Examples 7 – 8: Solve. Simplify radical answers. **You Try #8!**

7) $5b^2 - 3 = 97$

8) $-3a^2 + 4 = -32$

Examples 9 – 14: Solve for the variable. Simplify any radical answers.

9) $(x-2)^2 = 25$

10) $(x+1)^2 - 3 = 3$

11) $5(x+1)^2 - 3 = 77$

You Try #12 – 14!

12) $(x+4)^2 = 36$

13) $(x-5)^2 + 1 = 11$

14) $4(a-3)^2 - 8 = 0$

Examples 15 – 18: Solve for the variable. Simplify any radical answers.

15) $-3(x-2)^2 + 5 = -31$

16) $5(x+4)^2 + 20 = 10$

You Try #17 – 18!

17) $-4(x+2)^2 + 8 = 28$

18) $2(x-1)^2 - 3 = 13$

10.2 Notes: Solving Quadratics by Factoring, Day 1

Objectives:

- Use the Zero-Product Property to solve equations.
- Solve quadratic equations by factoring.

Warm-Up: With your group or a partner to factor the expressions below. If needed, use your Ch 8 Notes.

A) $x^2 + 5x + 4$

B) $a^2 - 9$

C) $6y^2 - 9y$

Exploration: Work with a partner or your group.

- Given that $ab = 0$. What must be true about *a* and/or *b*?

- Given that $(x - 2)(x + 5) = 0$. What values of *x* make this equation true? Why?

Zero-Product Property	Let *a* and *b* be real numbers. If *ab* = 0, then

For #1 – 4: Solve each equation for *x*.

1) $x(x - 6) = 0$

2) $-2.5x(x + 1) = 0$

3) $3(x - 2)(5x + 2) = 0$

You Try #4!

4) $4x(2x - 3)(x - 100) = 0$

Solving Quadratic Equations by Factoring	

Reminder: What are other names for the "solutions" of a quadratic equation?

Examples 5 – 10: Solve each equation for the variable by factoring.

5) $x^2 + 3x - 10 = 0$

6) $0 = h^2 - 25$

7) $a^2 - 10a + 25 = 0$

You try #8 – 10!

8) $x^2 - 49 = 0$

9) $b^2 + 2b + 1 = 0$

10) $0 = x^2 + 4x - 12$

Examples 11 – 13: Solve each equation for the variable by factoring. **You Try #13!**

11) $4x^2 + 8x = 0$

12) $-9x^2 + 6x = 0$

13) $15x^2 + 3x = 0$

Examples 14 – 19: Solve each equation for the variable by factoring. Reminder: look for the GCF first. Not all problems will have a GCF, but some will.

14) $2x^3 - 14x^2 - 36x = 0$

15) $-10x^2 + 90 = 0$

16) $6x^2 - 13x - 5 = 0$

17) $5x^2 - 20 = 0$

18) $-3x^3 - 18x^2 - 24x = 0$

19) $10x^2 - 3x - 1 = 0$

20) Consider the equation $3x^2 - 12 = 0$. Solve this problem in two ways:

By factoring

By square rooting (see the 10.1 Notes)

Did you get the same answer with each method?

21) Consider the equation $x^2 + 2x - 3 = 0$, which can be solved by factoring. Explain why this equation could *not* be solved by square rooting.

10.3 Notes: Solving Quadratics by Factoring, Day 2

Objectives:

- Use the Zero-Product Property to solve equations.
- Solve quadratic equations by factoring.
- Re-write equations so that they can be solved by factoring.

Writing Equations in Equivalent Forms	To solve an equation by factoring, the equation must be set equal to ________. If the equation is not set equal to ________, then it can be written in an equivalent form.
Standard Form of a Quadratic Equation	

Examples #1 – 6: Solve each equation by factoring.

1) $x^2 = -10x$

2) $x^2 + 40 = 14x$

3) $x^2 = -9x - 18$

You Try #4 – 6!

4) $x^2 - 3x = 40$

5) $x^2 = 8x + 9$

6) $9x^2 = -6x$

Examples #7 – 12: Solve each equation by factoring.

7) $3a = -a^2 + 10$

8) $3b^2 + 18 = -21b$

9) $-2x^2 - 15 = 11x$

You Try #10 – 12!

10) $x^2 - 30 = x$

11) $-2x^2 + 16x = 14$

12) $3 = -2x^2 + 5x$

Examples #13 – 16: Solve each equation by factoring.

13) $3a^2 - 18a - 45 = 3$

14) $49 = 4b^2$

You try #15 – 16!

15) $81 = 25y^2$

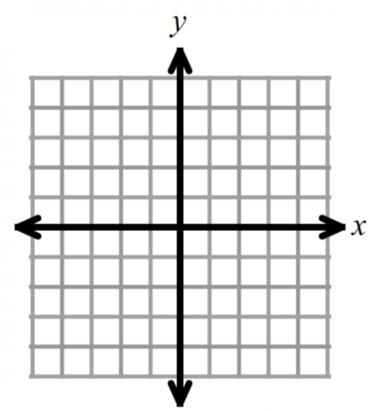
16) $-4x^2 + 14 = 8x + 2$

17) Consider the equation $x^2 - 3x + 1 = 0$.

- Can this equation be solved by square rooting? Why or why not?

- Can this equation be solved by factoring? Why or why not?

- Use a graphing calculator or technology to graph $y = x^2 - 3x + 1$. Sketch the graph to the right.



- How many x-intercepts does this quadratic function have? __________ So how many solutions should the equation have? _________
- Note: we will learn another method next class that could be used to solve this equation.

10.4 Notes: The Quadratic Formula

Objectives

- Use the Quadratic Formula to solve quadratic equations.
- Determine when a quadratic equation has no solution.

The Quadratic Formula	
When can the Quadratic Formula be used?	

For Examples #1 – 4, solve each equation for *x* by using the quadratic formula. If needed, write your answers as simplified radicals.

1) $x^2 - 5x + 2 = 0$

2) $x^2 + 9 = 9x$

You try #3 – 4!

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

4) $x^2 + 5x - 5 = 0$

For Examples 5 – 8, solve each equation for *x* by using the quadratic formula. If needed, write your answers as simplified radicals.

5) $5x^2 + 3x - 9 = 0$

6) $5x^2 + 3x + 2 = 0$

You try #7 – 8!

7) $x^2 + 3 = 4x$

8) $4x^2 - x + 20 = 0$

For Examples 9 – 10, solve each equation for *x* by using the quadratic formula. If needed, write your answers as simplified radicals.

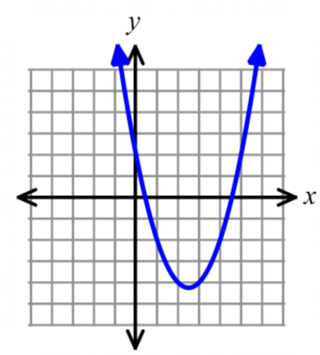
9) $3x^2 - 2 = -10x$

You try!

10) $2x^2 - 6x - 5 = 0$

Example 11: Consider the function $y = x^2 - 5x + 2$

a) From #1 in this lesson, you had solved $x^2 - 5x + 2 = 0$ for *x* by using the quadratic equation. Write down the answers you had gotten from this problem here:

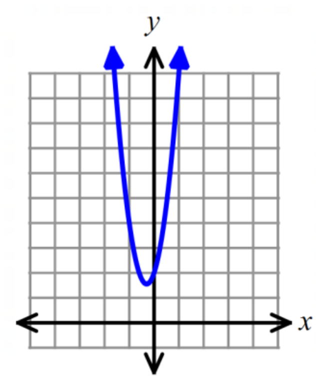


b) Use a calculator to convert these solutions for *x* to decimals rounded to the nearest tenth.

c) The graph of the function $y = x^2 - 5x + 2$ is shown to the right. What did you find when you solved this equation for *x*?

Example 12: Consider the function $y = 5x^2 + 3x + 2$

a) From #6 in this lesson, you had solved $5x^2 + 3x + 2 = 0$ for *x* by using the quadratic equation. Write down the answers you had gotten from this problem here:



b) The graph of the function $y = 2x^2 - 2x + 4$ is shown to the right. What did you find when you solved this equation for *x*?

Ch 10 Study Guide: Solving Quadratics

Technique	Hints and Steps	Read about it in your notes!
Solving by Square Rooting $ax^2 + c = \text{constant}$ $a(x-h)^2 + k = \text{constant}$	• Cancel c or k by adding or subtracting from both sides • Divide both sides by a. • Square root both sides ($\pm$) • If the variable is not isolated, then add or subtract *h* from both sides. • Reminder: $x^2 \neq$ negative… if it does, then there is *no solution.*	Section 10.2
Solving by Factoring $ax^2 + bx + c = 0$ $ax^2 + c = 0$	• Get a 0 on one side of the equation. • Factor completely. • Set each factor = 0 and solve by using the Zero Product Property.	Sections 10.2 and 10.3
Solving by the Quadratic Formula $ax^2 + bx + c = 0$	• Get a 0 on one side of the equation. • Use $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ • Reminder: $\sqrt{\text{negative}}$ means there is *no solution.*	Section 10.4