Unit 2 Day 7

Quadratic Formula & the Discriminant

Warm Up Day 7

1. Solve each of the quadratic functions by graphing and algebraic reasoning:

a. $x^2 - 3 = 0$

b. $x^2 + 5x - 8 = 0$

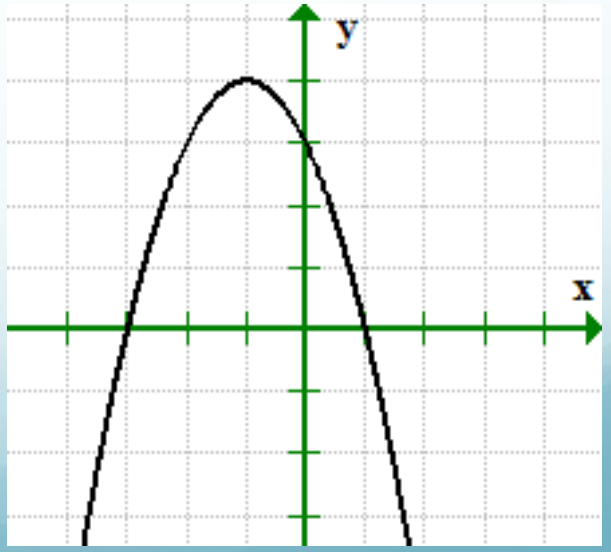
c. Explain why having alternative methods of solving quadratic functions is important.

2. Simplify the radicals.

a. $\sqrt{50}$

b. $3\sqrt{80}$

3. Find the equation of the graph in standard form. Show all work.



Warm Up Answers

1. Solve each of the quadratic functions by graphing and algebraic reasoning:

a. $x^2 - 3 = 0$ $\pm\sqrt{3}$

b. $x^2 + 5x - 8 = 0$ Approx. { -6.27, 1.27 }
(Use Calc "zeros" feature)

$$\frac{-5 \pm \sqrt{57}}{2}$$

Today you'll see how to get an exact answer for non factorable quadratics like problem b ☺

c. Explain why having alternative methods of solving quadratic functions is important.

Sample Answer: Some quadratic equations cannot be factored, so we need multiple methods. Getting a decimal answer in the calculator is rounded, so it isn't a precise or exact answer.

Warm Up ANSWERS

Remember, you reviewed this material with the HW after the Unit 1 Test. See that HW for examples. ☺

2. Simplify the radicals.

a. $\sqrt{50}$ $5\sqrt{2}$

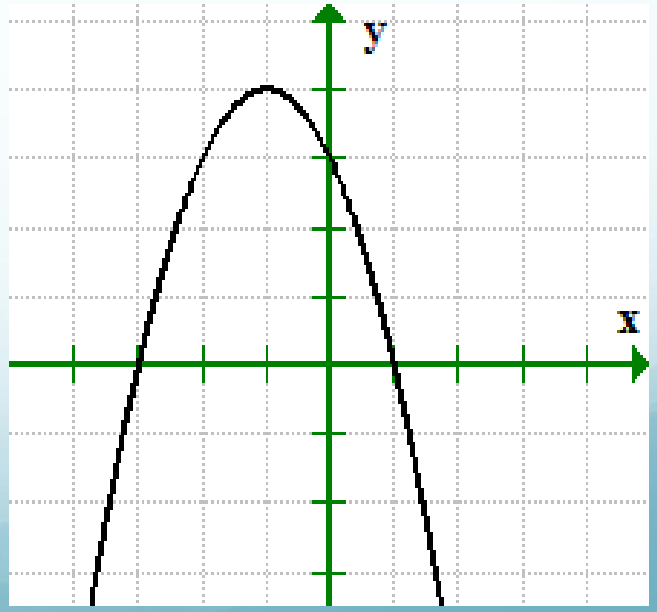
OR $\sqrt{25 \bullet 2} = \sqrt{25} \bullet \sqrt{2} = 5\sqrt{2}$

b. $3\sqrt{80}$ $12\sqrt{5}$

OR $3\sqrt{16 \bullet 5} = 3\sqrt{16} \bullet \sqrt{5} = 12\sqrt{5}$

3. Find the equation of the graph in standard form. Show all work.

$$y = -x^2 - 2x + 3$$



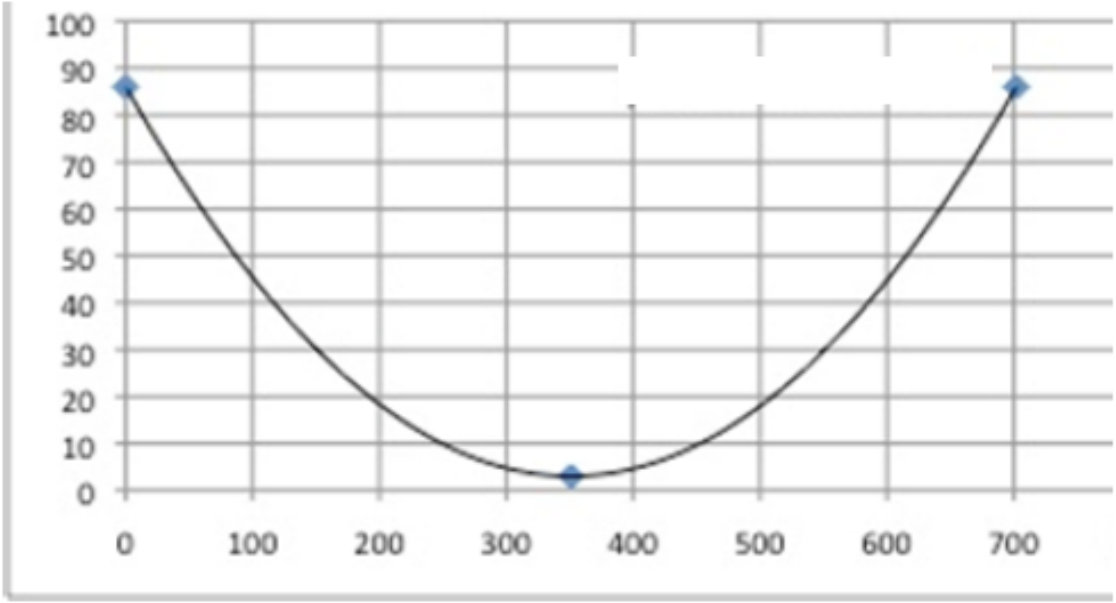
Homework Answers

1)

Verrazano Bridge

Horizontal Distance (x)	Height of Cable (y)
0	160
100	114.4
200	77.6
300	49.6
400	30.4
500	20

Brooklyn Bridge



Tappan Zee Bridge

$y = .00025x^2 - .2x + 100$

a. Using the information, determine the length of each bridge to decide which one is longest and shortest.

Short: Brooklyn 700 ft, Long: Verrazano 1136 ft*, Tappan Zee: 800*
*To find length, get equation in y1, THEN find y-value of y-intercept THEN do y2 = y-value of y-intercept THEN do 2nd Trace Intersect

b. Which bridge's cable gets the closest to the road? How do you know this?

Brooklyn: (350, <10), Verrazano: (568, 18), Tappan Zee: (400, 60)
The Brooklyn Bridge gets closest to the road because it has the vertex with the lowest y-value

Homework Answers

2) 9 yds X 7 yds

3) a) Henry's at around 4.7 seconds.

b) Henry's at around 92 feet.

c) Henry threw the ball the highest and it stayed in the air longest.

4) $y = -\frac{3}{8}x^2 + \frac{3}{4}x + \frac{45}{8}$

5) $F(x) = 3x^2 - 3x - 18$

Homework Tonight
Packet p. 10-12 ODDS only
And
Complete all of the "First" problems

Study For The Quiz Tomorrow!

* Study For The Quiz Tomorrow! *

It will be *Cumulative* of all the Unit 2 material – including today's material.

Remember to use the resources on Blackboard for help:
-PowerPoint's
-extra practice problems

The Quadratic Formula

Solving Quadratics with the Quadratic Formula

Standard form of a quadratic ***equation***: $y = ax^2 + bx + c$

Solutions of some quadratic equations are not rational, or are too messy to obtain by factoring. For such equations, the most common method of solution is the quadratic formula.

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

Study this for tomorrow's quiz!! ☺

can be used to solve for x.

Notice that there is a +/- sign in the formula. There are actually **TWO ANSWERS** for any quadratic formula.

Tips for using Quadratic Formula!
(add these in to your notes)

- Be careful with signs!

- Substitute values into the formula in parentheses! This is especially important with b. Remember, the calculator follows the order of operations, but is only as smart as its user!

- Always simplify
  - Check if the radical can be simplified & do it!
  - At the end of the problem, cover up the radical and check for a GCF. If there is one, you must factor it out of all 3 parts!

Solve using the quadratic formula.

Example 1: $x^2 + 9x + 20 = 0$

$$x = \frac{-9 \pm 1}{2}$$

$x = \{-5, -4\}$

Example 2: $x^2 - x = 5x - 9$

$$x = \frac{6 \pm 0}{2}$$

$x = \{3\}$

Example 4: $7x^2 - 12x + 3 = 0$

$$x = \frac{6 \pm \sqrt{15}}{7}$$

You TRY Some Practice Problems!

Example 3: $-x^2+2x=2$

Example 5: $4x^2+12x+9=0$

Example 6: $x^2-5x-5=0$

You TRY Answers!

Example 3: $-x^2+2x=2$

$$x=\frac{-2\pm\sqrt{-4}}{-2} \qquad x=1\pm i$$

Example 5: $4x^2+12x+9=0$

$$x=\frac{-12\pm 0}{8} \qquad x=\{\frac{-3}{2}\}$$

Example 6: $x^2-5x-5=0$

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

The Discriminant

Notes p. 21
Types of Zeros

Take a few minutes on this Discovery Activity

Notes

Recall the quadratic formula:

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

This part in the square root helps us to determine how many solutions a quadratic will have:

$$b^2 - 4ac$$

This is called the **Discriminant.**

Calculate the discriminant for these problems.

1. $x^2 - x - 6 = 0$ **25**

2. $x^2 + 16 = 0$ **-64**

3. $x^2 + 4x + 4 = 0$ **0**

Types of Quadratic Solutions

Quadratic solutions are either **real** or **imaginary.**

- **Real solutions** are the solutions you get from factoring, the zeroes on the graph, and when you are able to do the square root in the quadratic formula.
- **Imaginary solutions** do not show up on the graph or when factoring. In fact, quadratics with imaginary solutions cannot be factored.
  - You'll study more about Imaginary Solutions in Math 3!

Discriminants

- If the discriminant is **positive**, the quadratic has _two real_ solutions.

  Like $x = 3/2, -1/2$ Or $x = \pm 2\sqrt{5}$

  - Rational solutions are when the discriminant evaluates to _a perfect square._ Like $x = 3/2, -1/2$ Or $x = \pm 2$

  - Irrational solutions are when the discriminant evaluates to _NOT a perfect square._

    Like $x = \pm 2\sqrt{5}$

Remember, rational means it can be a ratio…a simplified fraction! ☺

Discriminants

- If the discriminant is **zero**, the quadratic has **one real rational** solution.

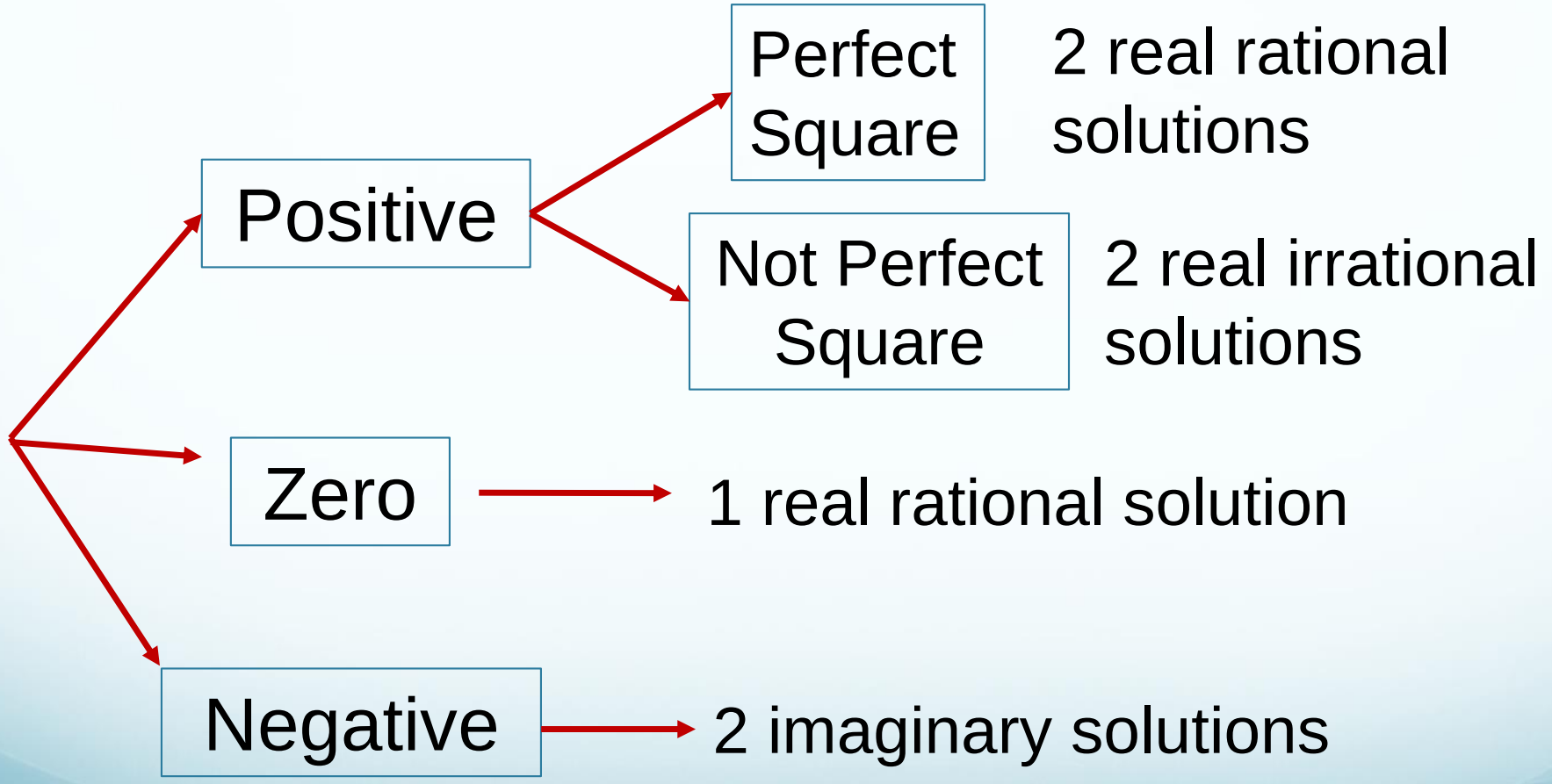
  Like x = 3 Double Root! ☺

- If the discriminant is **negative**, the quadratic has **two imaginary** solutions

  Like $x = \pm\sqrt{-4}$

Discriminant FLOW CHART

Add this to your Notes



Practice Notes p. 22-23: YOU TRY!

Determine the amount and types of solutions.

1. $x^2 - 6x + 11 = 2$

0; one real rational solution

2. $3x^2 + 5x = 12$

169; two real rational solutions

3. $3x^2 + 48 = 0$

-576; two imaginary solutions

4. $x^2 - 27 = 0$

108; 2 real irrational solutions

5. $x^2 + x + 1 = 0$

-3; two imaginary solutions

6. $x^2 + 4x - 1 = 0$

20; 2 real irrational solutions

7. $6x^2 + 12x + 6 = 0$

0; one real rational solution

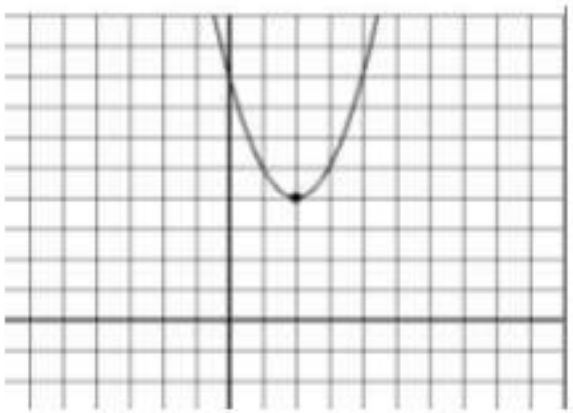
8. $-3x^2 - 4x - 8 = 0$

- 80; two imaginary solutions

Given the following graphs of quadratic functions:

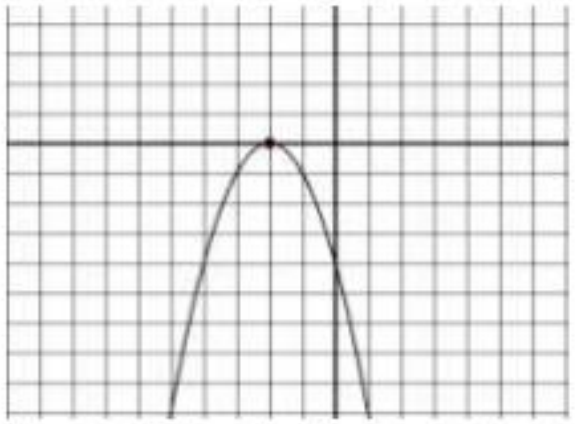
a) determine the sign of the discriminant and
b) whether the solutions are real or imaginary.

1.



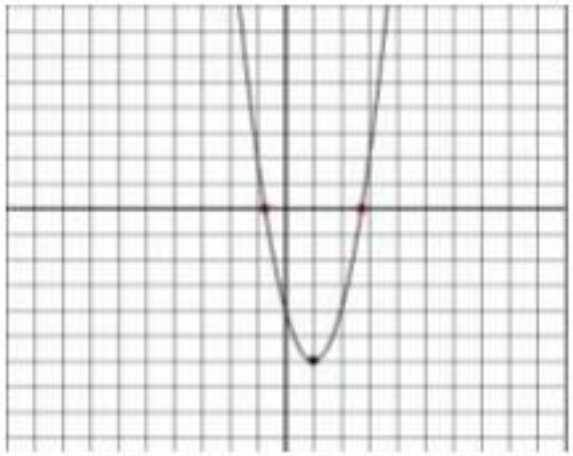
Negative; 2 imaginary solutions

2.



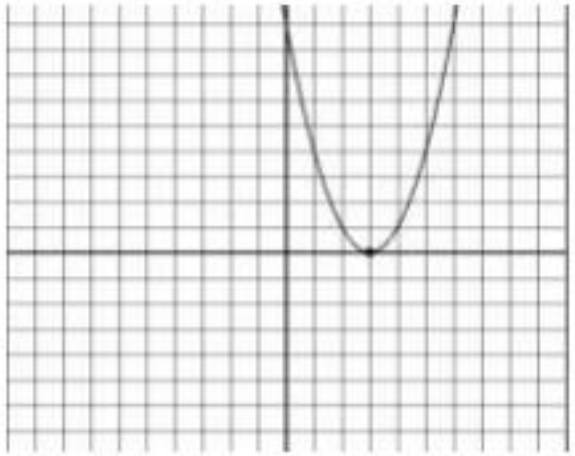
0; 1 real solution

3.



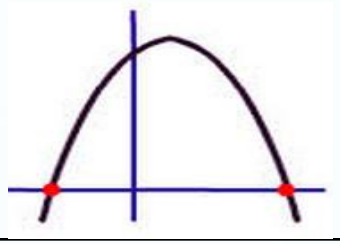
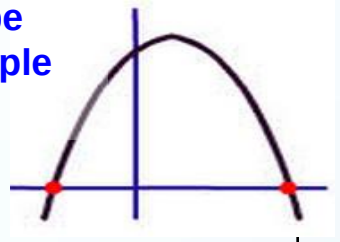
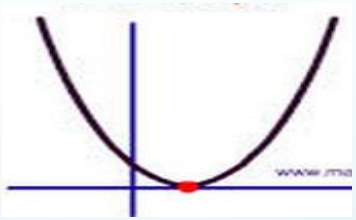
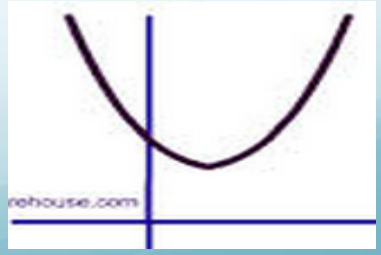
Positive; 2 real solutions

4.

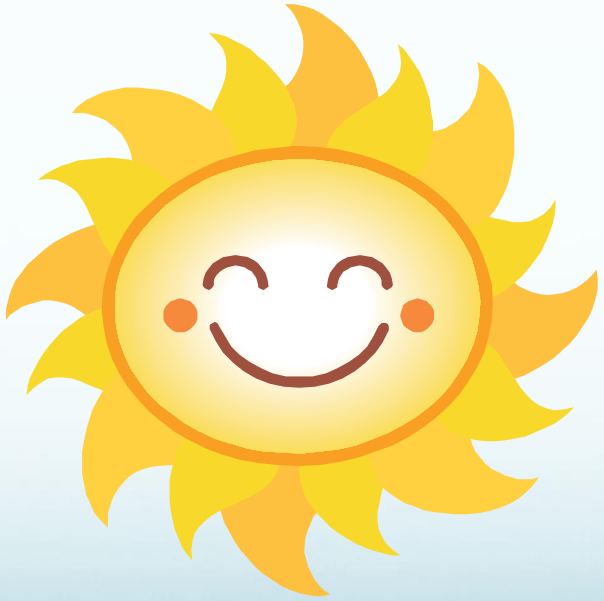


0; 1 real solution

EVERYTHING I NEED TO KNOW ABOUT QUADRATICS

Value of the discriminant ($b^2 - 4ac$)	Number and type of roots	What does the graph look like?
$b^2 - 4ac$ is positive and a **perfect square** **$b^2 - 4ac > 0$**	2 real **rational** roots	
$b^2 - 4ac$ is positive and is **NOT perfect square** $b^2 - 4ac > 0$	2 real **irrational** roots	**Values cannot be written as a simple fraction!** 
$b^2 - 4ac = 0$	1 real **rational** root	
$b^2 - 4ac$ is negative $b^2 - 4ac < 0$	2 imaginary roots	

Discriminant Practice Notes p. 24



Function	Discriminant	Number and Type of Solutions
Ex: $x^2 - 3x - 4 = 0$	25	2 rational solutions
1. $x^2 - 6x + 9 = 0$		
2. $x^2 + 6x = -9$		
3. $x^2 - 6x - 16 = 0$		
4. $2x^2 - 6x - 13 = 0$		
5. $-x^2 + 2x - 1 = 0$		
6. $2x^2 + 3 = 2x$		
7. $x^2 + 2x + 1 = 0$		
8. $x^2 + 2x = -3$		
9. $x^2 - 6x + 9 = 0$		
10. $x^2 + 5x + 8 = 0$		
11. $2x^2 - 5x + 6 = 0$		
12. $x^2 - 5x = 10$		
13. $x^2 - 6x + 3x = 4 - 11$		

Function	Discriminant	Number and Type of Solutions
Ex: $x^2 - 3x - 4 = 0$	25	2 real rational solutions
1. $x^2 - 6x + 9 = 0$	0	1 real rational solution
2. $x^2 + 6x = -9$	0	1 real rational solution
3. $x^2 - 6x - 16 = 0$	100	2 real rational solutions
4. $2x^2 - 6x - 13 = 0$	140	2 real irrational solutions
5. $-x^2 + 2x - 1 = 0$	0	1 real rational solution
6. $2x^2 + 3 = 2x$	-20	2 imaginary solutions
7. $x^2 + 2x + 1 = 0$	0	1 real rational solution
8. $x^2 + 2x = -3$	-8	2 imaginary solutions
9. $x^2 - 6x + 9 = 0$	0	1 real rational solution
10. $x^2 + 5x + 8 = 0$	-7	2 imaginary solutions
11. $2x^2 - 5x + 6 = 0$	-23	2 imaginary solutions
12. $x^2 - 5x = 10$	65	2 real irrational solutions
13. $x^2 - 6x + 3x = 4 - 11$	-19	2 imaginary solutions

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Packet p. 10-12 ODDS only
And
Complete all of the "First" problems

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