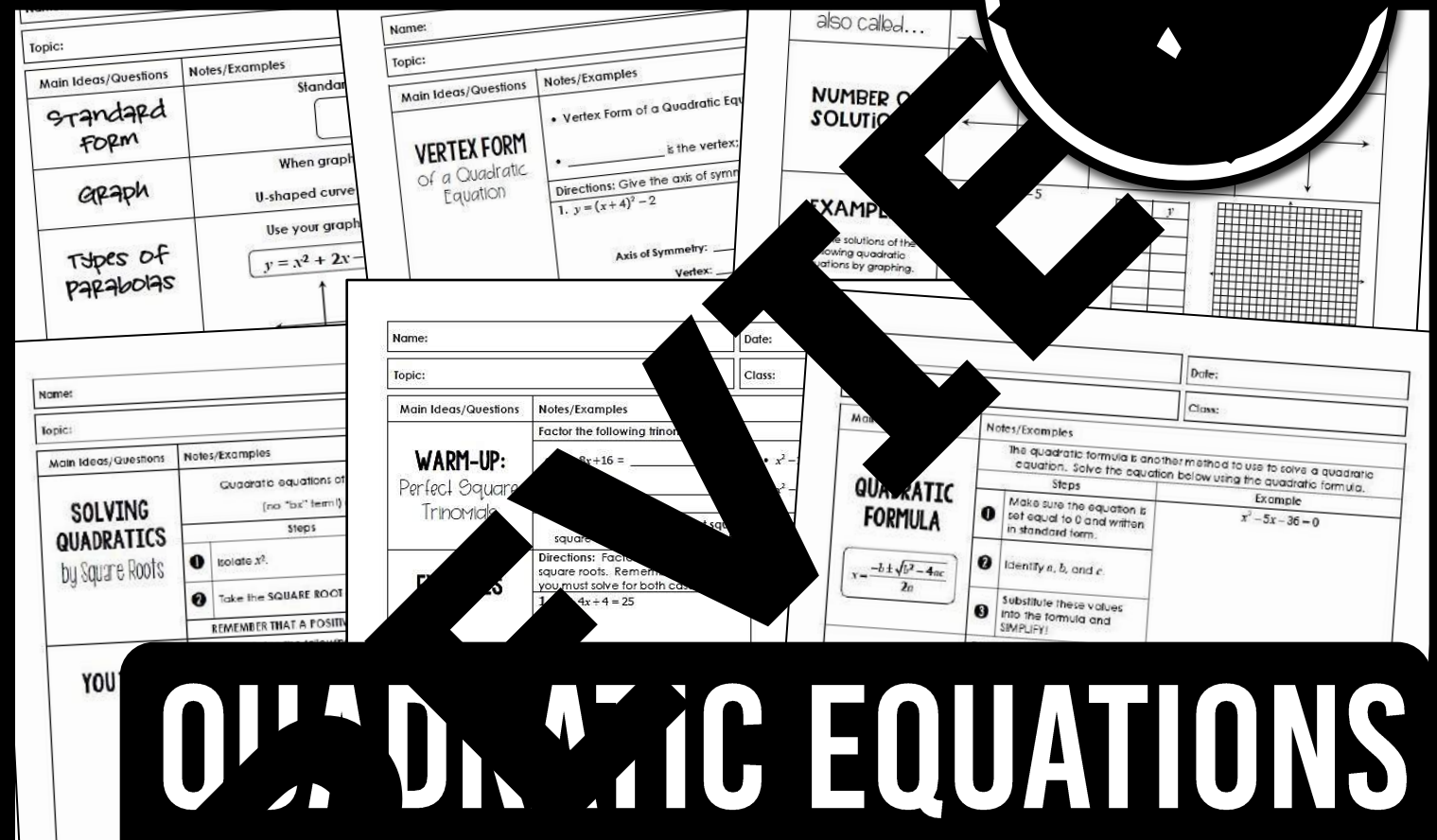


ALGEBRA I

Unit



QUADRATIC EQUATIONS

NOTES • HOMEWORK • QUIZZES • TEST

Created by: ALL THINGS ALGEBRA®



Thank you SO MUCH

for purchasing this resource!

If you have any questions or comments, please email me at allthingsalgebra@gmail.com.

Visit www.allthingsalgebra.com for more resources like this!

Let's Stay Connected!



[Join the All Things Algebra® Facebook Community!](#)

TERMS OF USE

© 2015-2026 Gina Wilson (All Things Algebra®)

LICENSING TERMS:

This resource is licensed for use by the individual teacher to whom the license is assigned. It may not be shared with other teachers, departments, schools, or districts. Each teacher using the resource must purchase their own license.

Non-transferable licenses are owned by the purchaser or the teacher for whom they were purchased and are not to be shared. Transferable licenses are school-owned and may be reassigned to another teacher as staffing changes. To request a license transfer, please contact schools@allthingsalgebra.com.

For schools or districts interested in purchasing transferable licenses to accommodate multiple teachers, they may contact schools@allthingsalgebra.com for a quote.

COPYRIGHT TERMS:

No part of this resource may be uploaded or shared online, including on classroom or personal websites, network drives, or shared folders, unless access is password-protected and restricted to students only. Any videos featuring this material must also be accessible only to your students. This resource is for personal classroom use only. Creating derivative works is prohibited.

Thank you for respecting my work!



Unit 8 – Quadratic Equations: Sample Unit Outline

	TOPIC	HOMEWORK
DAY 1	Introduction to Quadratic Equations: Standard Form, Axis of Symmetry, Vertex, Minimum, Maximum	HW #1
DAY 2	Graphing Quadratic Equations	HW #2
DAY 3	Vertex Form of a Quadratic Equation; Transformations	HW #3
DAY 4	Quiz 8-1	None
DAY 5	Quadratic Roots and the Discriminant	HW #4
DAY 6	Solving Quadratics by Factoring (Day 1)	
DAY 7	Solving Quadratics by Factoring (Day 2)	HW #6
DAY 8	Compare Vertex Form, Standard Form, and Factored Form	Study for Quiz
DAY 9	Quiz 8-2	None
DAY 10	Solving Quadratics by Solving for Roots (includes rational and irrational solutions)	HW #7
DAY 11	Solving Quadratics by Completing the Square (Day 1 – $a = 1$, includes rational and irrational solutions)	HW #8
DAY 12	Solving Quadratics by Completing the Square (Day 2 – $a > 1$, includes rational and irrational solutions)	HW #9
DAY 13	Quiz 8-3	None
DAY 14	Solving Quadratics by the Quadratic Formula	HW #10
DAY 15	Solving Quadratics Review	HW #11
DAY 16	Methods Comparison; Choosing the Best Method	HW #12
DAY 17	Quiz 8-4	None
DAY 18	Applications: Area and Consecutive Integer Problems	HW #13
DAY 19	Applications: Projectile Motion	HW #14
DAY 20	Linear vs. Quadratic Regression	HW #15
DAY 21	Unit 8 Review	Study for Test
DAY 22	UNIT 8 TEST	None
ADDITIONAL RESOURCES: Video Links & Google Slides Suggested Activities		

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
Standard Form	Standard Form of a Quadratic Equation:
Graph	When graphed, a quadratic equation creates a U-shaped curve called a _____.
Types of Parabolas	Use your graphing calculator to sketch the following: $y = x^2 + 2x - 5$ $y = -x^2 - 2x + 7$ - If 'a' is _____, then the parabola opens _____, like a smiley face 😊. - If 'a' is _____, then the parabola opens _____, like a frowny face ☹️.
Axis of Symmetry	_____ for the axis of symmetry:
Vertex	- When the vertex is the <u>lowest point</u>, it is called a _____. - When the vertex is the <u>highest point</u>, it is called a _____.
Examples	Find the axis of symmetry and vertex, then sketch each parabola. Axis of Symmetry: _____ Vertex: _____ Sketch: _____ 1. $y = x^2 + 8x + 15$

2. $y = -x^2 + 10x - 23$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
3. $y = 3x^2 - 12x + 5$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
4. $y = 4x^2 + 8x - 1$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
5. $y = -x^2 - 4x - 2$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
6. $y = -3x^2 - 24x - 42$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
7. $y = -x^2 - 6x - 8$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
8. $y = x^2 - 3$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____
9. $y = -2x^2 + 8$	Axis of Symmetry: _____ Vertex: _____ Sketch: _____

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 1: Introduction to Quadratics

**** This is a 2-page document! ****

Directions: Complete the following statements.

1. The standard form of a quadratic equation is _____.
2. The curve formed by a quadratic equation is called a _____.
3. The formula for the axis of symmetry is _____.
4. If the vertex is the highest point on the graph, it is called a _____.
5. If a vertex is the lowest point on a graph, it is called a _____.

Directions: Find the axis of symmetry and vertex for the following quadratic equations. Then, sketch the parabola and label all parts.

6. $y = x^2 + 6x + 4$

Axis of Symmetry: _____ Vertex: _____

Sketch:

7. $y = -2x^2 + 8x - 5$

Axis of Symmetry: _____ Vertex: _____

Sketch:

8. $y = x^2 - 4x - 5$

Axis of Symmetry: _____ Vertex: _____

Sketch:

9. $y = x^2 - 8x - 9$

Axis of Symmetry: _____ Vertex: _____

Sketch:

10. $y = -5x^2 - 20x - 26$

Axis of Symmetry: _____ Vertex: _____

Sketch:

11. $y = x^2 - 4$

Axis of Symmetry: _____ Vertex: _____

Sketch:

12. $y = -x^2 + 2x - 4$

Axis of Symmetry: _____ Vertex: _____

Sketch:

13. $y = -3x^2$

Axis of Symmetry: _____ Vertex: _____

Sketch:

14. $y = x^2 + 12x + 1$

Axis of Symmetry: _____ Vertex: _____

Sketch:

15. $y = x^2 + 10x + 24$

Axis of Symmetry: _____ Vertex: _____

Sketch:

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

Steps to Graph a QUADRATIC EQUATION

- ① Find the **axis of symmetry**.
- ② Find the **vertex**.
- ③ Put the vertex in the middle row of the table. Fill in a row on each side using your calculator.
- ④ Plot the points and connect them into a smooth parabola.

EXAMPLES

Directions: Graph each quadratic equation using a table. Label the axis of symmetry, vertex, domain, and range.

1. $y = x^2$

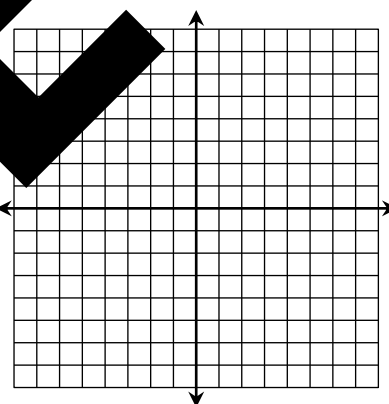
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

	y



2. $y = x^2 + 2x - 1$

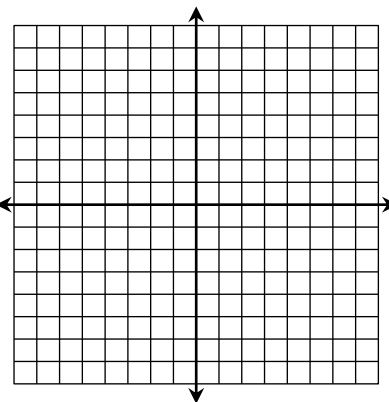
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



3. $y = -x^2 - 8x - 17$

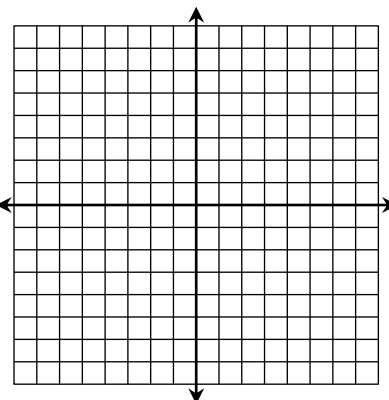
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



4. $y = -2x^2 + 4x + 1$

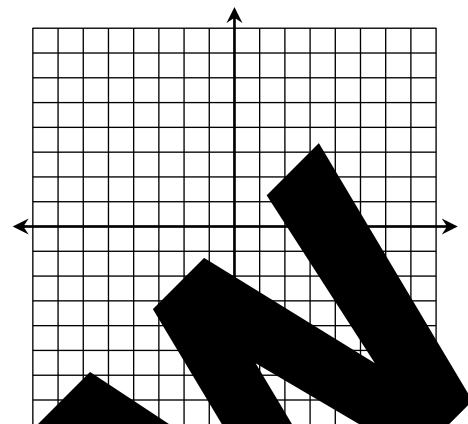
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



5. $y = x^2 - 6x + 11$

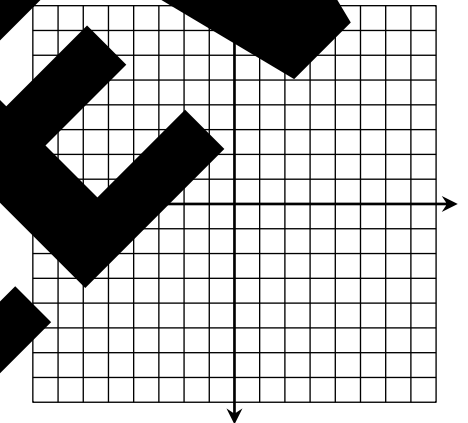
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



6. $y = x^2 - 2$

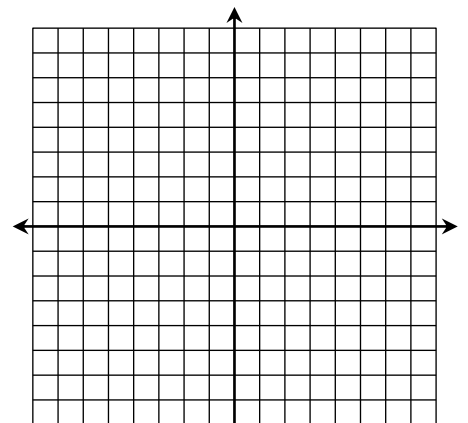
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



7. $y = 2x^2 + 8x$

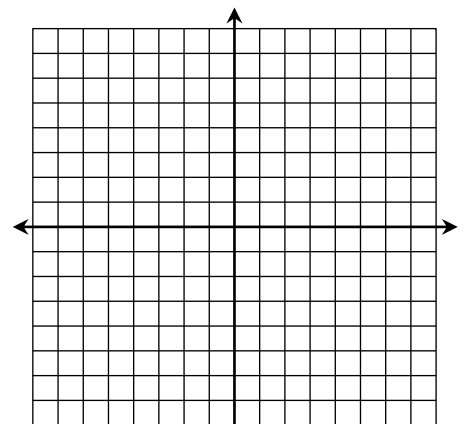
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



8. $y = -x^2 + 4x + 3$

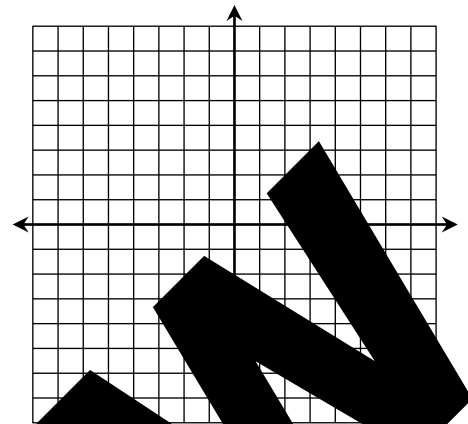
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



9. $y = -x^2 - 2x$

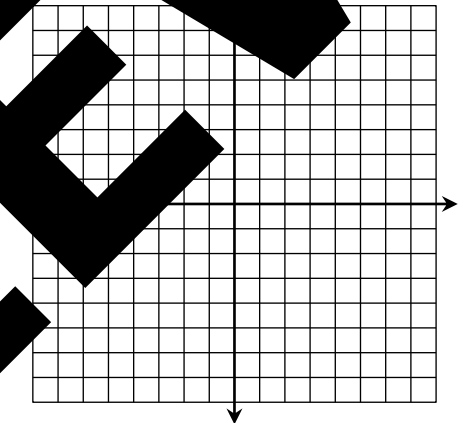
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



10. $y = 3x^2 - 12x + 11$

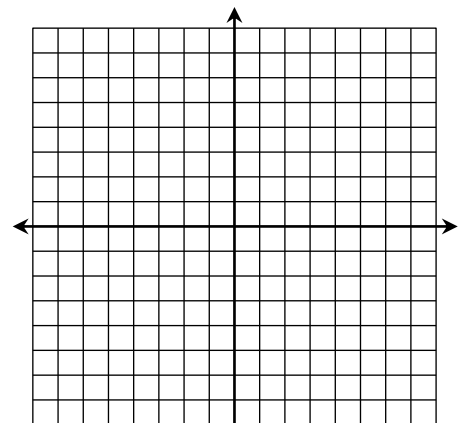
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



11. $y = \frac{1}{2}x^2 - 6x + 11$

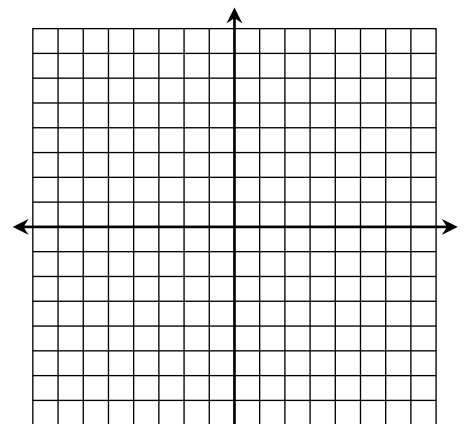
Axis of Symmetry: _____

Vertex: _____

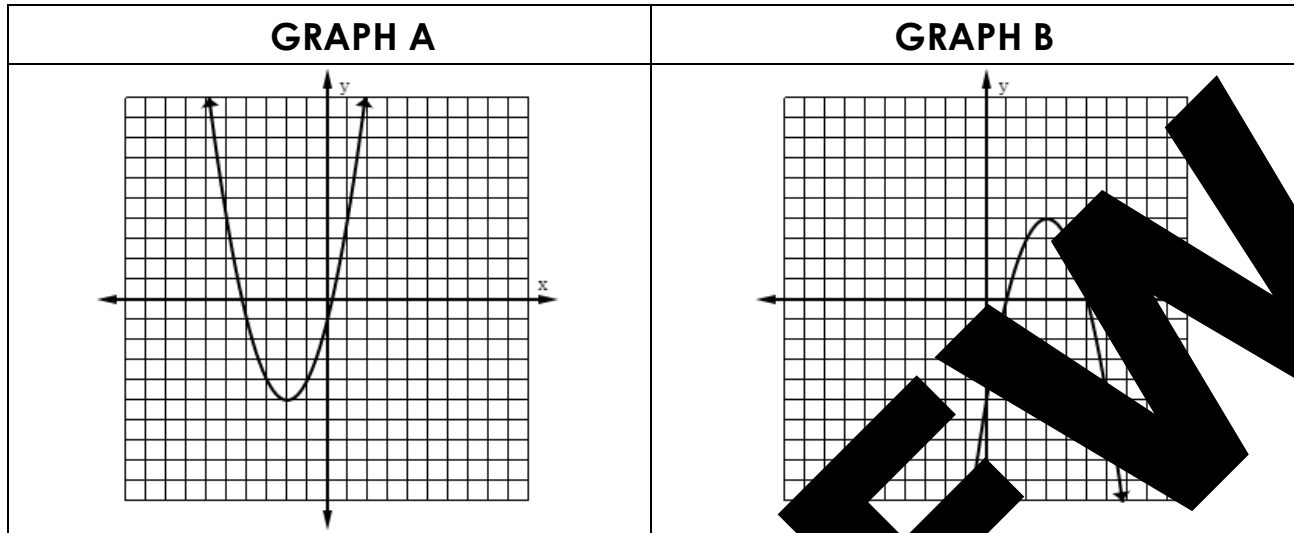
Domain: _____

Range: _____

x	y



Analyzing Quadratic Graphs



Answer the questions given the graphs above.

- What is the **axis of symmetry** for **Graph A**? _____
- What is the **axis of symmetry** for **Graph B**? _____
- What is the **vertex** of **Graph A**? _____ **Maximum** or **Minimum**? _____
- What is the **vertex** of **Graph B**? _____ **Maximum** or **Minimum**? _____
- Identify the **domain** and **range** of **Graph A**.
Domain: _____ Range: _____
- Identify the **domain** and **range** of **Graph B**.
Domain: _____ Range: _____
- Identify the **equation** for **Graph A**:

A. $y = x^2 - 4x - 1$	C. $y = -x^2 - 4x - 1$
B. $y = x^2 + 4x - 1$	D. $y = -x^2 + 4x - 1$
- Identify the **equation** for **Graph B**:

A. $y = x^2 - 6x - 5$	C. $y = -x^2 - 6x - 5$
B. $y = x^2 + 6x - 5$	D. $y = -x^2 + 6x - 5$

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

Homework 2: Graphing Quadratic Equations

**** This is a 2-page document! ****

Graph each quadratic equation using a table of values. Identify all key characteristics.

1. $y = x^2 + 10x + 26$

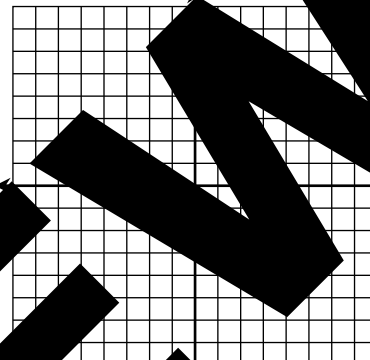
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



2. $y = -2x^2 + 8x$

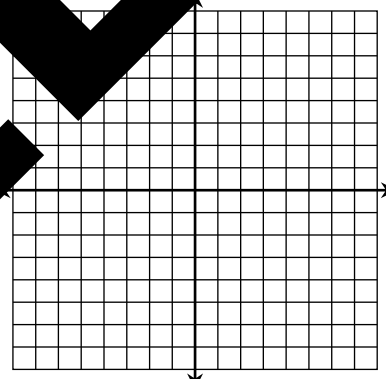
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



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

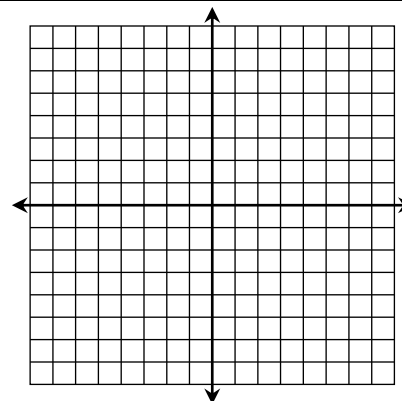
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



4. $y = -x^2 + 8x - 16$

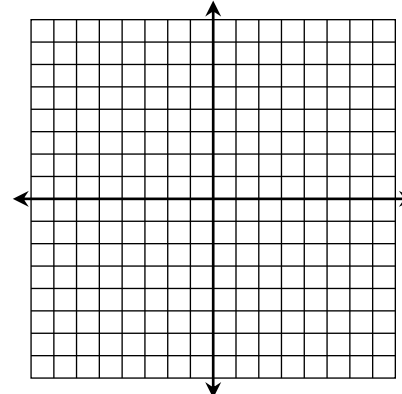
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



5. $y = 3x^2 - 5$

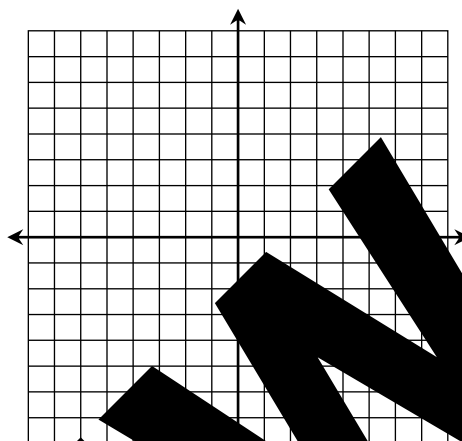
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



6. $y = -2x^2 + 12x - 15$

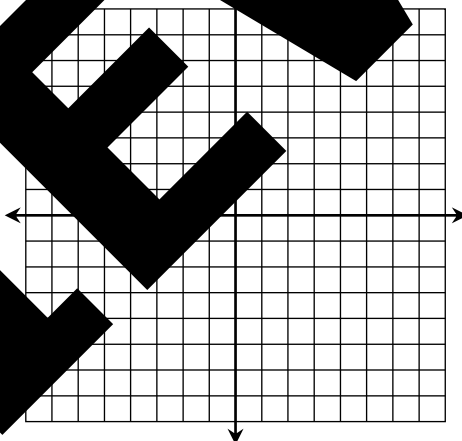
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



7. $y = -x^2 + 1$

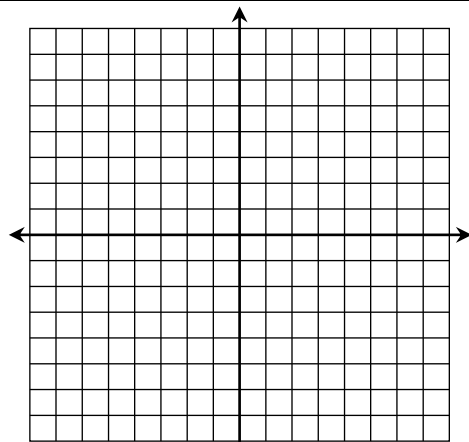
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



8. $y = 2x^2 - 16x + 3$

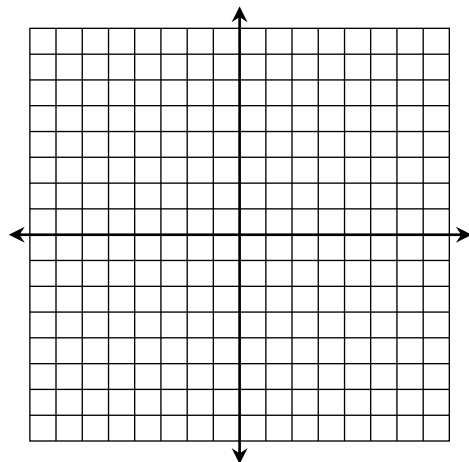
Axis of Symmetry: _____

Vertex: _____

Domain: _____

Range: _____

x	y



Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples														
VERTEX FORM of a Quadratic Equation	- Vertex Form of a Quadratic Equation: _____ is the vertex; _____ is the axis of symmetry.														
	Directions: Give the axis of symmetry and vertex for each equation.														
	1. $y = (x + 4)^2 - 2$ Axis of Symmetry: _____ Vertex: _____ 2. $y = (x - 5)^2 + 3$ Axis of Symmetry: _____ Vertex: _____														
	3. $y = (x - 5)^2 - 4$ Axis of Symmetry: _____ Vertex: _____ 4. $y = (x + 2)^2 + 1$ Axis of Symmetry: _____ Vertex: _____														
GRAPHING from Vertex Form	Directions: Graph each equation using a table of values. Identify the axis of symmetry, vertex, domain, and range.														
	5. $y = (x + 2)^2 + 7$ Axis of Symmetry: _____ Vertex: _____ Domain: _____ Range: _____ <table border="1" style="margin-bottom: 10px;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	x	y												
	x	y													
6. $y = 3(x - 1)^2$ Axis of Symmetry: _____ Vertex: _____ Domain: _____ Range: _____ <table border="1" style="margin-bottom: 10px;"> <thead> <tr><th>x</th><th>y</th></tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	x	y													
x	y														

TRANSFORMATIONS

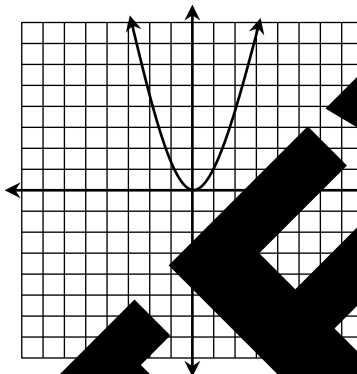
from the
Parent Function

- The most simplistic quadratic equation is _____.
- This is known as the _____.
- A **transformation** is a _____ to the _____ or _____ of a figure.

Directions: Graph each function. Describe how it compares to the parent function shown on the graph.

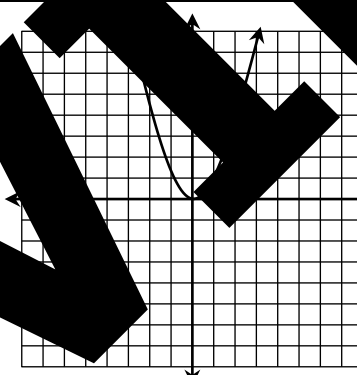
7. $y = (x + 2)^2$

x	y



8. $y = x^2 + 5$

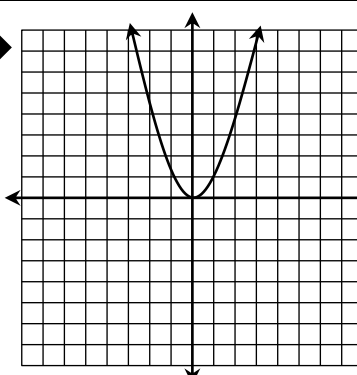
x	y



Transformations:

9. $y = (x - 4)^2 - 6$

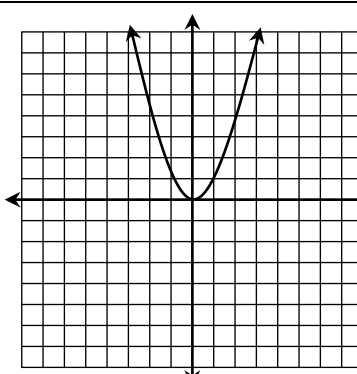
x	y



Transformations:

10. $y = -(x - 4)^2 + 1$

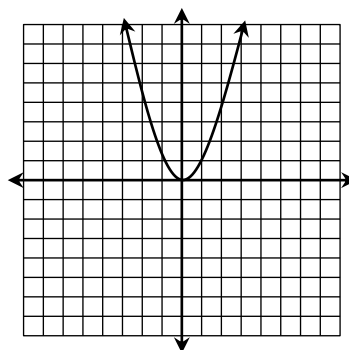
x	y



Transformations:

$$11. y = 3x^2 - 7$$

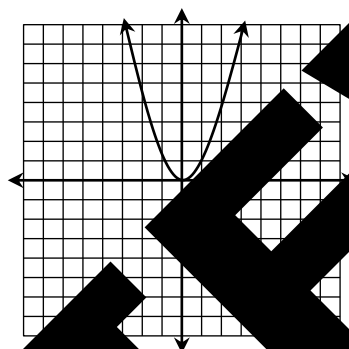
x	y



Transformations:

$$12. y = -\frac{1}{2}(x-3)^2 - 2$$

x	y



**PUT IT
TOGETHER!**

Given a quadratic equation in vertex form, $y = a(x-h)^2 + k$:

- h is the _____ shift _____, $-$ shifts _____)
- k is the _____ shift _____, $-$ shifts _____)
- If a is negative, the parabola opens _____ across the _____ - _____
- $|a|$ represents a vertical _____.
- $|a| < 1$ represents a vertical _____.

**WRITING
EQUATIONS**

Directions: Transformations from the parent function $y = x^2$ are described below. Write an equation to represent the function.

13. translated 5 units right

14. translated 5 units up

15. translated 3 units left and 4 units down

16. translated 7 units right and 4 units up

17. reflected over the x-axis, then translated 3 units down

18. reflected over the x-axis, then translated 5 units right and 2 units down

19. vertically compressed by a factor of $1/3$, then translated 8 units up

20. vertically stretched by a factor of 2, reflected over the x-axis, then translated 4 units left

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

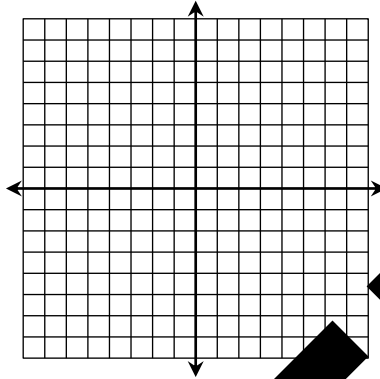
Homework 3: Vertex Form of a Quadratic Equation

**** This is a 2-page document! ****

Graph each equation and give the axis of symmetry, vertex, domain, and range. Then, identify the transformations of the equation from the parent function.

1. $y = -x^2 - 3$

x	y



Axis of Symmetry:

Vertex:

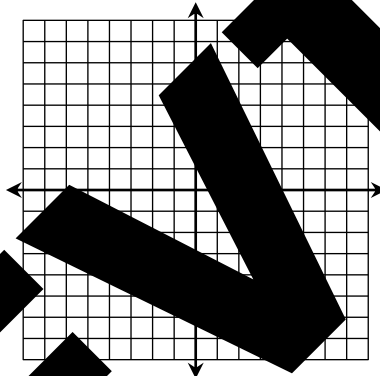
Domain:

Range:

Transformations:

2. $y = (x + 5)^2$

x	y



Axis of Symmetry:

Vertex:

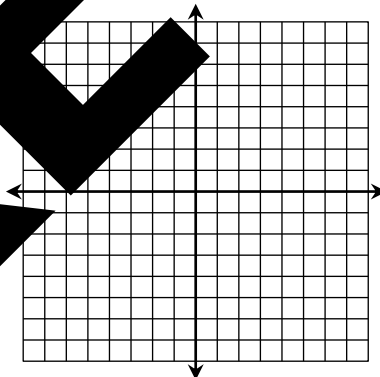
Domain:

Range:

Transformations:

3. $y = (x - 2)^2 - 6$

x	y



Axis of Symmetry:

Vertex:

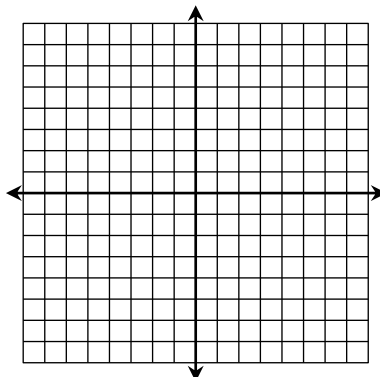
Domain:

Range:

Transformations:

4. $y = (x + 1)^2 - 4$

x	y



Axis of Symmetry:

Vertex:

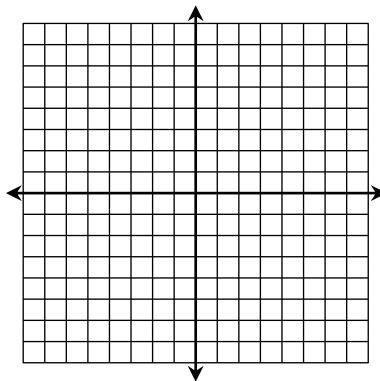
Domain:

Range:

Transformations:

5. $y = \frac{1}{3}(x-4)^2$

x	y



Axis of Symmetry:

Vertex:

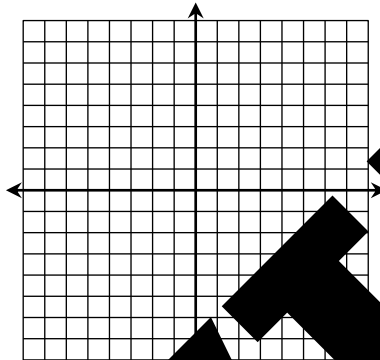
Domain:

Range:

Transformations:

6. $y = -2(x+3)^2 + 7$

x	y



Axis of Symmetry:

Vertex:

Domain:

Transformations:

Without graphing, describe the transformations from the parent function.

7. $y = (x-2)^2 - 1$

8. $y = 4x^2 - 5$

9. $y = -\frac{1}{2}(x+1)^2$

Transformations on the parent function are given below. Write an equation to represent the function.

10. reflected over the y-axis, then translated 6 units up

11. translated 1 unit right and 5 units down

12. vertically stretched by a factor of 3, then translated 4 units up

13. reflected over the x-axis, then vertically compressed by a factor of 1/4

14. reflected over the x-axis, then translated 8 units left and 3 units up

15. vertically stretched by a factor of 5/2, reflected over the x-axis, then translated 3 units down

Name: _____

Date: _____ Per: _____

Algebra I

Unit 8: Quadratic Equations

Quiz 8-1: Graphing Quadratic Equations

Identify the following forms of a quadratic equation:

1. Standard Form
2. Vertex Form

1. _____
2. _____

Using the axis of symmetry formula, find the axis of symmetry and vertex for each equation.

3. $y = -x^2 + 10x - 26$

Axis of Symmetry: _____ Vertex: _____

4. $y = 3x^2 - 6x$

Axis of Symmetry: _____ Vertex: _____

5. $y = 2x^2 - 4$

Axis of Symmetry: _____ Vertex: _____

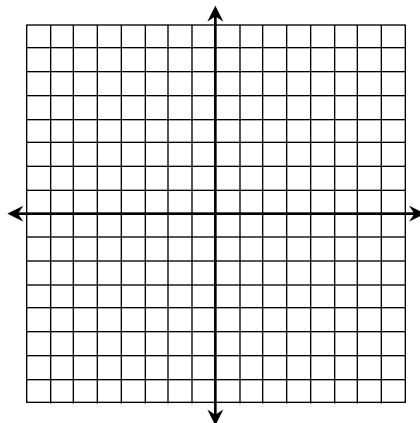
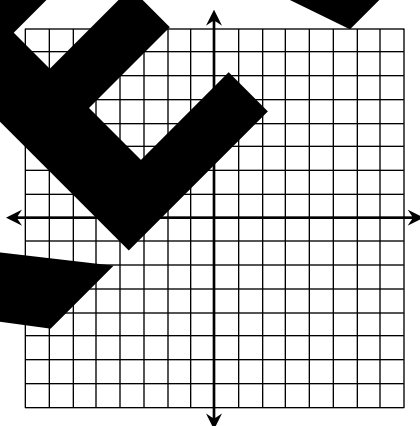
Graph each equation using a table of values, and identify each characteristic.

6. $y = x^2 - 4x - 3$

x	

$y = x^2 - 8x - 4$

x	y



Axis of Symmetry:

Vertex:

Domain:

Range:

Axis of Symmetry:

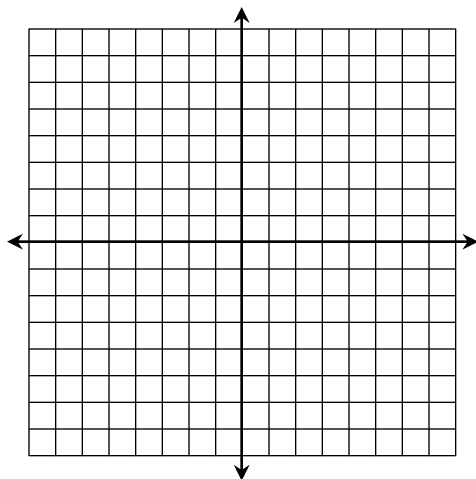
Vertex:

Domain:

Range:

8. $y = -(x - 1)^2$

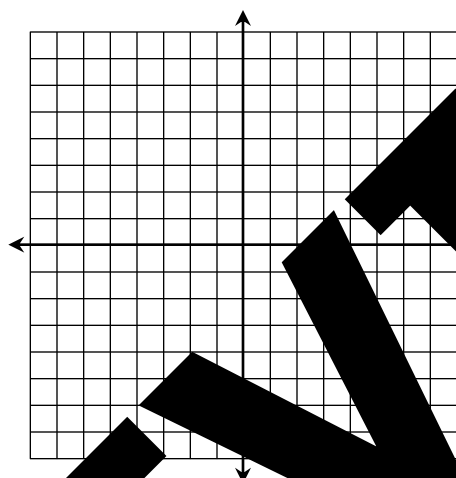
x	y



Axis of Symmetry:
Vertex:
Domain:
Range:
Transformations:

9. $y = \frac{1}{2}(x + 4)^2 - 8$

x	y



Axis of Symmetry:
Vertex:
Domain:
Range:
Transformations:

Without graphing, determine the transformations of each equation from its parent function.

10. $y = -x^2 + 4$

Transformations:

11. $y = 3(x - 6)^2 - 2$

Transformations:

The transformations of the parent function of a quadratic equation are given below. Write an equation of the new function in vertex form.

translated 3 units down

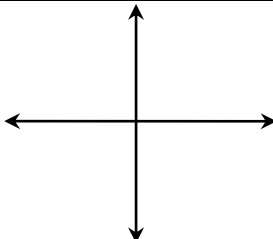
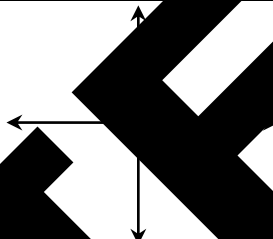
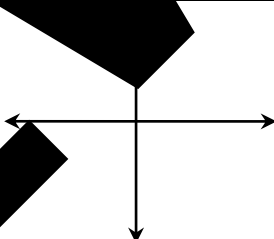
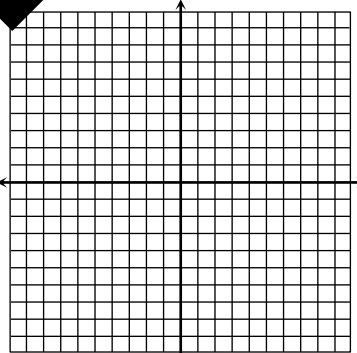
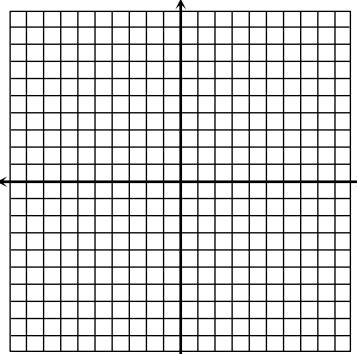
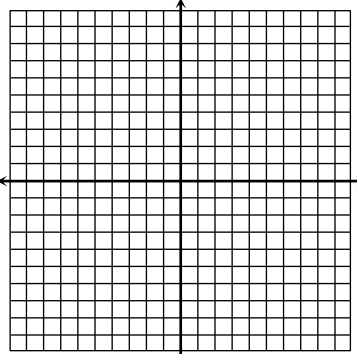
13. translated 7 units right and 2 units up

14. reflected over the x-axis, then translated 5 units left

15. vertically stretched by a factor of 2, then translated 4 units left and 1 unit down

12. _____
13. _____
14. _____
15. _____

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples																						
QUADRATIC ROOTS																							
also called...																							
NUMBER OF SOLUTIONS	2 SOLUTIONS	1 SOLUTION	NO SOLUTION																				
																							
EXAMPLES																							
	Find the solutions of the following quadratic equations by graphing.																						
	Solutions:																						
1. _____	1. $y = x^2 + 4x - 5$	<table><tr><th>x</th><th>y</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	x	y																			
x	y																						
2. _____	2. $y = x^2 - 2x + 1$	<table><tr><th>x</th><th>y</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	x	y																			
x	y																						
3. _____	3. $y = -x^2 + 2x - 3$	<table><tr><th>x</th><th>y</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	x	y																			
x	y																						

Solutions:

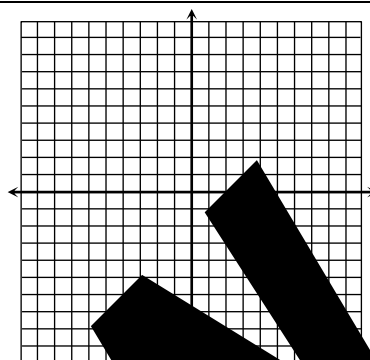
4. _____

5. _____

6. _____

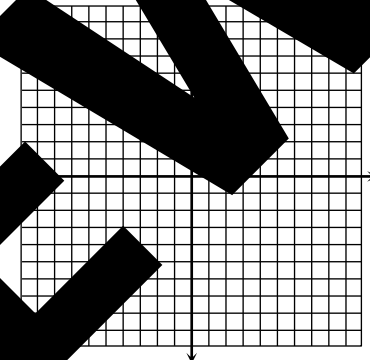
4. $y = x^2 - 10x + 16$

x	y



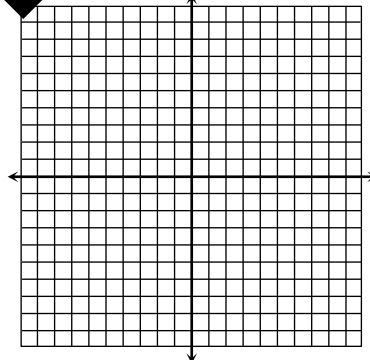
5. $y = -x^2 + 9$

x	y



6. $y = -3x^2 + 6x$

x	y



THE DISCRIMINANT

Formula

- If $d > 0$, then there are ____ solutions.
- If $d = 0$, then there are ____ solutions.
- If $d < 0$, then there are ____ solutions.

EXAMPLES

Use the discriminant to determine the number of solutions.

7. $y = x^2 + 5x + 4$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

8. $y = x^2 - 3x + 10$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

9. $y = x^2 + 10x + 25$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

10. $y = 2x^2 - 4x - 3$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

11. $y = 4x^2 - 12x + 9$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

12. $y = -3x^2 + 5x - 8$

- ☐ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 4: Quadratic Roots

**** This is a 2-page document! ****

1. The points at which a quadratic equation intersects the x -axis are referred to as:

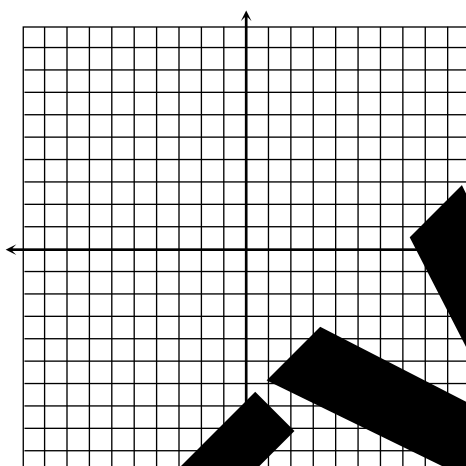
- _____
- _____

- _____
- _____

Graph each quadratic equation and identify its solutions.

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

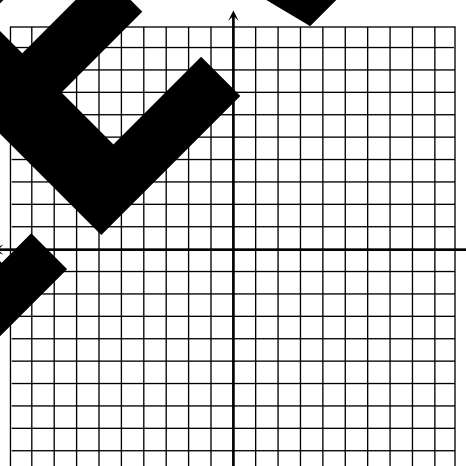
x	y



Solutions: _____

3. $y = x^2 - 8x$

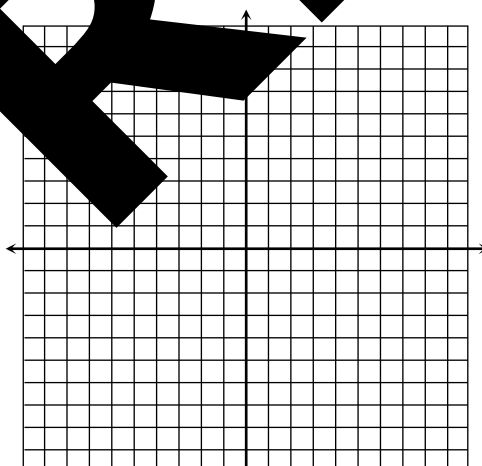
x	y



Solutions: _____

4. $y = x^2 - 4$

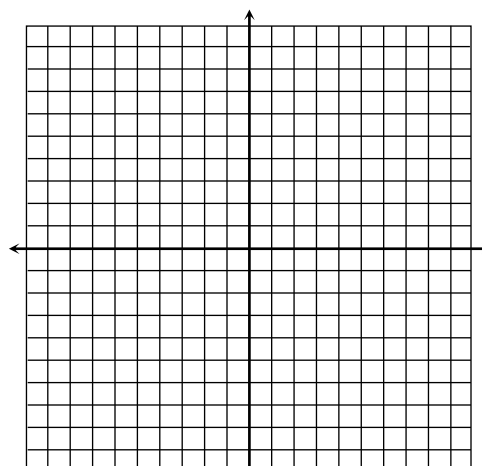
x	y



Solutions: _____

5. $y = -x^2 + 10x - 21$

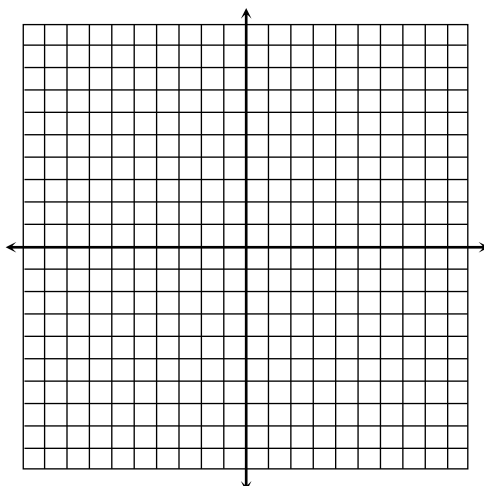
x	y



Solutions: _____

6. $y = x^2 - 4x + 5$

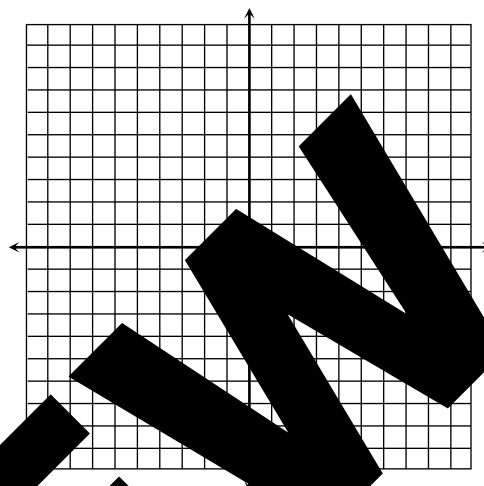
x	y



Solutions:

7. $y = -2x^2 - 8x$

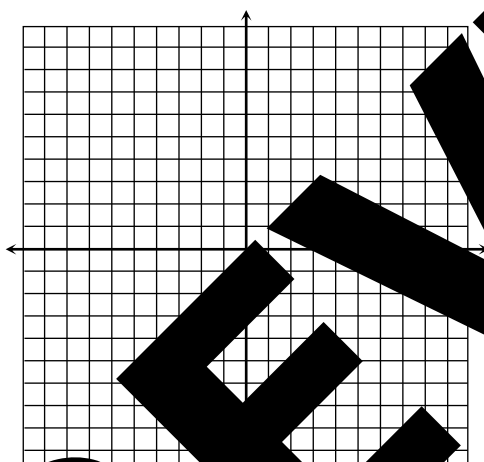
x	y



Solutions:

8. $y = x^2 - 6x + 9$

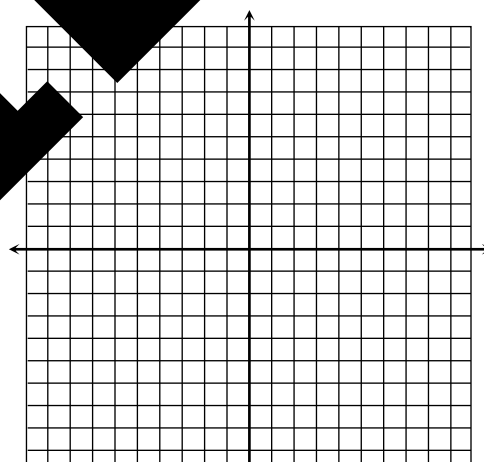
x	y



Solutions:

9. $y = x^2 + 4x + 4$

x	y



Solutions:

Use the discriminant to determine the number of solutions.

10. $y = -3x^2 + 6x - 3$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

12. $y = -3x^2 + 5x - 1$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

14. $y = -x^2 + 2x - 1$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

11. $y = 2x^2 - 4x + 3$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

13. $y = x^2 - 5x - 10$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

15. $y = 4x^2 - 9$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

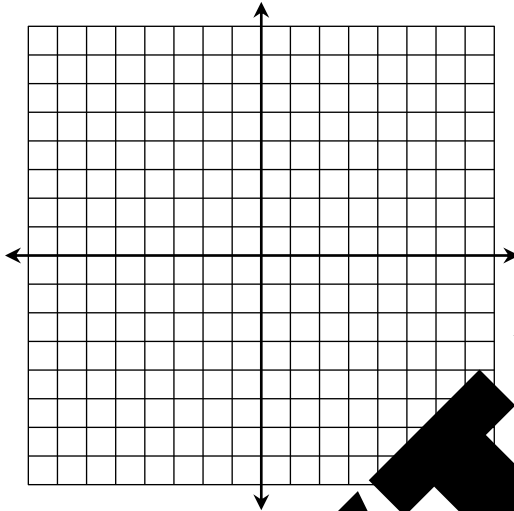
entrance ticket

Name: _____

Graph the quadratic equation using a table of values. Then, identify each characteristic.

1) $y = -x^2 - 6x - 5$

x	y



Axis of Symmetry:
Vertex:
Domain:
Range:
Zeros:

TURN OVER!

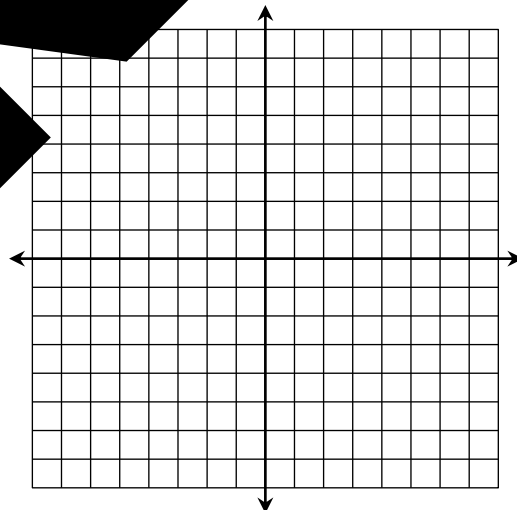
entrance ticket

Name: _____

Graph the quadratic equation using a table of values. Then, identify each characteristic.

1) $y = -x^2 - 6x - 5$

x	y

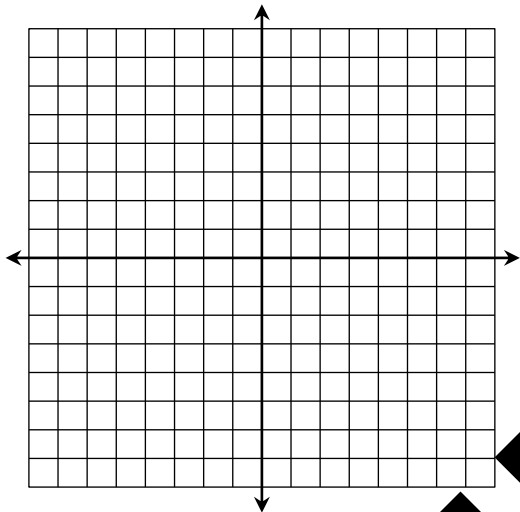


Axis of Symmetry:
Vertex:
Domain:
Range:
Zeros:

TURN OVER!

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

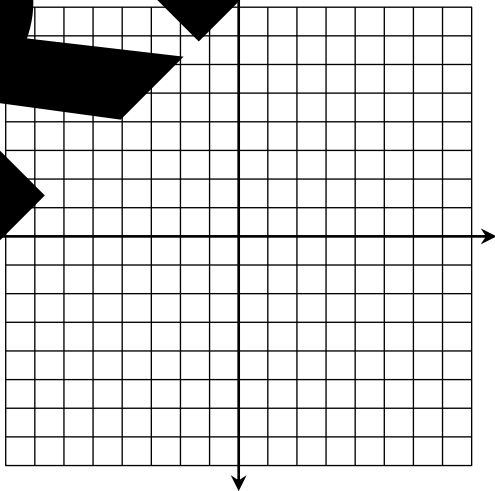
x	y



Axis of Symmetry:
Vertex:
Domain:
Range:
Zeros:

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

x	y



Axis of Symmetry:
Vertex:
Domain:
Range:
Zeros:

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples	
SOLVING QUADRATICS <i>By Factoring</i>	In many cases, we can find the solutions (or roots, zeros, x-intercepts) of a quadratic equation by factoring, rather than graphing. Follow the steps below to find the solutions of the given equation by factoring.	
	① Set the quadratic equation equal to 0.	Given: $y = x^2 + 5x - 6$
	② Factor the left side.	
	③ Set each factor equal to 0 and solve each factor for x.	
	④ Write your answer using curly braces.	
YOU TRY!	Directions: Solve the following quadratic equations by factoring.	
	1. $x^2 + 4x + 3 = 0$	2. $x^2 - 12x + 24 = 0$
	3. $x^2 - x - 2 = 0$	4. $x^2 + 6x - 27 = 0$
	5. $x^2 + 11x + 21 = 0$	6. $x^2 - x - 20 = 0$
	7. $x^2 + 10x + 25 = 0$	8. $x^2 - 8x + 16 = 0$

$$9. x^2 - 8x = 0$$

$$10. 3x^2 + 15x = 0$$

$$11. 6x^2 - 12x = 0$$

$$12. 8x^2 - 6x = 0$$

$$13. x^2 - 64 = 0$$

$$14. x^2 - 25 = 0$$

$$15. 4x^2 - 81 = 0$$

$$16. 9x^2 - 49 = 0$$

$$17. x^2 + 4x = 21$$

$$18. x^2 - 45 = 4x$$

$$19. 5x - 64 = 7x$$

$$20. x^2 - 10x + 49 = 4x + 1$$

$$21. 11x^2 = x^2 + 8x$$

$$22. 16x^2 = 9$$

**EQUATIONS
NOT IN
Standard Form**

MOVING VARIABLE TO THE LEFT

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

Homework 5: Solving Quadratics by Factoring
(Day 1)

**** This is a 2-page document! ****

Solve each quadratic equation by factoring.

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

2. $x^2 - 8x - 9 = 0$

3. $x^2 - x - 30 = 0$

4. $x^2 - 8x$

5. $x^2 - 10 = 9x$

6. $x^2 + 12x = x - 24$

7. $x^2 - 3x - 10 = 7x$

8. $x^2 + 3x - 5 = -1$

9. $x^2 - 46 = 3x - 1$

10. $x^2 - 14x - 18 = -8x - 2$

11. $2x^2 - 7x + 4 = x^2 - 8$

12. $x^2 + x + 53 = 4 - 13x$

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

14. $8x^2 - 10x = 0$

15. $6x^2 - 2x = x$

16. $9x^2 - 5x = 0$

17. $x^2 - 36 = 0$

18. $16x^2 - 49 = 0$

19. $x^2 - 1 = 0$

20. $3x^2 - 21 = 4 - x^2$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples	
SOLVING QUADRATICS By Factoring (DAY 2!)	Example 1: $3x^2 + 9x - 12 = 0$	Example 2: $5x^2 - 20x + 15 = 0$
	Example 3: $2x^2 + 3x - 2 = 0$	Example 4: $3x^2 - 22x + 5 = 0$
YOU TRY!	Solve the following quadratic equations by factoring.	
	1. $10x + 8 = 0$	2. $4x^2 - 24x - 28 = 0$
	3. $3x^2 + 13x - 10 = 0$	4. $5x^2 - 8x + 3 = 0$

5. $2x^2 + 13x - 7 = 0$

6. $6x^2 + 5x + 1 = 0$

7. $4x^2 - 8x - 5 = 0$

8. $x^2 + 12x + 35 = 0$

9. $3x^2 - 7x = 0$

10. $8x^2 + 3 = 10x$

11. $12x^2 + 32x = -5$

12. $5x^2 + 7x = x^2 + 2$

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

Homework 6: Solving Quadratics by Factoring
(Day 2)

**** This is a 2-page document! ****

Solve each quadratic equation by factoring.

1. $2x^2 - 8x - 24 = 0$

2. $5x^2 + 5x - 30 = 0$

3. $4x^2 + 12x + 8 = 0$

4. $x^2 - 15x + 12 = 0$

5. $3x^2 - 7x - 6 = 0$

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

7. $4x^2 - 12x - 5 = 0$

8. $10x^2 - x - 2 = 0$

9. $6x^2 + 7x + 2 = 0$

10. $12x^2 - 11x + 2 = 0$

11. $3x^2 - 14x = 5$

12. $2x^2 + 14 =$

13. $8 - 3x = 5x^2$

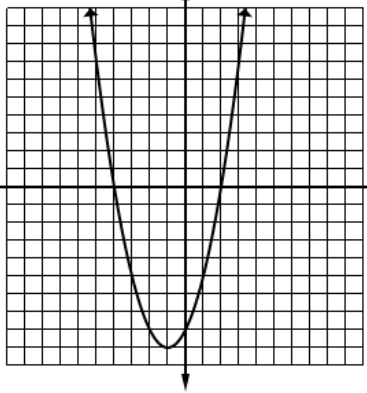
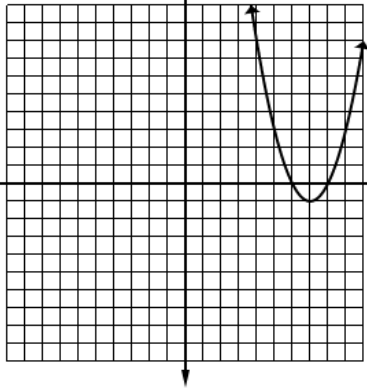
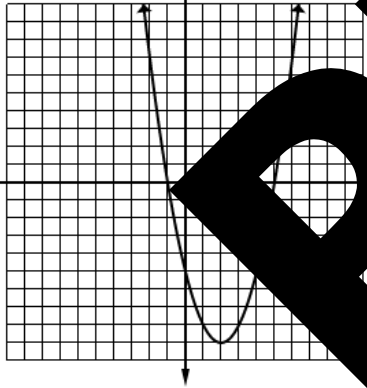
$5x + 11 = -6x^2$

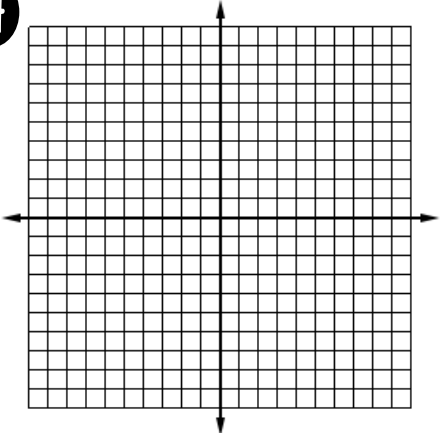
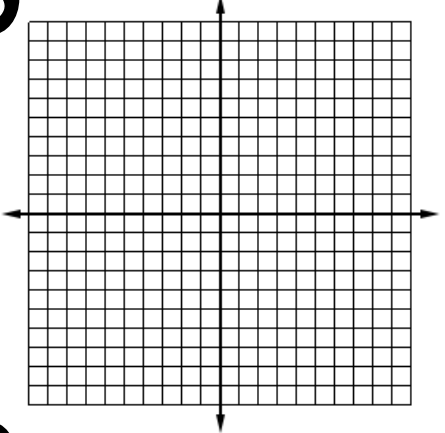
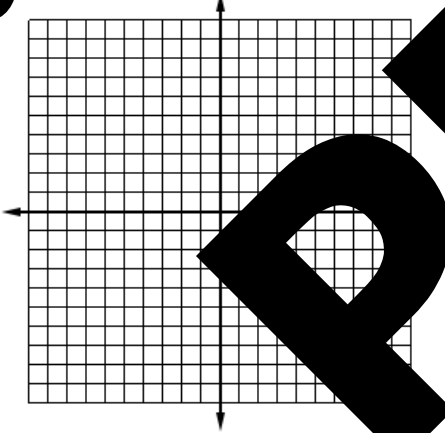
15. $12x^2 - 17x + 5 =$

16. $9 = 12x - 4x^2$

Representing **QUADRATIC EQUATIONS**

Quadratic equations can be represented in vertex form, standard form, or factored form.
Complete each row of the chart below with the given information.

	GRAPH	VERTEX FORM	STANDARD FORM	FACTORED FORM
1				
2				
3				

	GRAPH	VERTEX FORM	STANDARD FORM	FACTORED FORM
4		$y = (x + 5)^2 - 4$		
5		$y = -(x - 1)^2 + 4$		
6		$y = 2(x + 4)^2 - 8$		

Name: _____

Algebra I

Date: _____ Per: _____

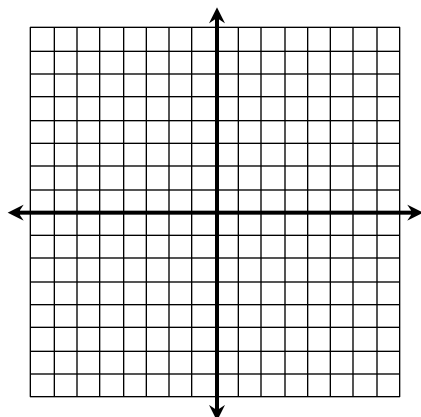
Unit 8: Quadratic Equations

Quiz 8-2: Quadratic Roots; Solving Quadratics by Factoring

Find the zeros of each quadratic equation below by graphing.

1. $y = -x^2 + 6x - 5$

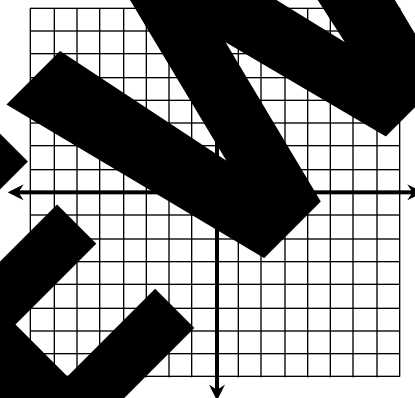
x	y



Zeros: _____

2. $y = x^2 + 2x + 1$

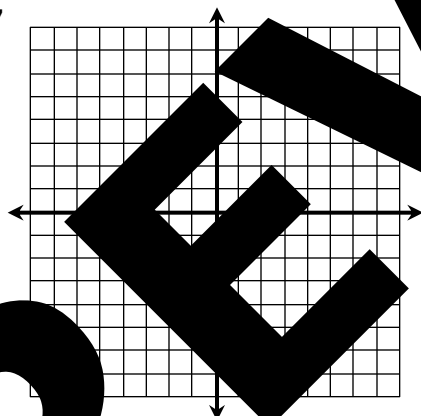
x	y



Zeros: _____

3. $y = -x^2 + 8x - 17$

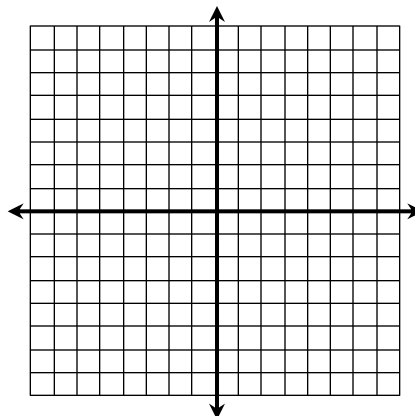
x	y



Zeros: _____

4. $y = x^2 - 4$

x	y



Zeros: _____

Use the discriminant to determine the number of solutions for each quadratic equation.

5. $y = x^2 - 10x + 25$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

6. $y = -3x^2 + 7x + 6$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

7. $y = -x^2 - 5$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

8. $y = 2x^2 + 9x$

- ☐ 2 solutions
☐ 1 solution
☐ 0 solutions

Solve the following quadratic equations by factoring.

9. $x^2 + 5x - 24 = 0$

10. $x^2 = 18x - 81$

11. $3x^2 + 9x - 30 = 0$

12. $5x^2 - 25x = 5x - 40$

13. $6x^2 - x - 2 = 0$

14. $2x^2 = 31x - 2x$

15. $10x^2 = 6x$

16. $x^2 = 25$

9. _____

10. _____

11. _____

12. _____

13. _____

15. _____

B. _____

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

SOLVING QUADRATICS

by Square Roots

Quadratic equations of the form _____
(no "bx" term!) can be solved using **square roots**.

Steps

Example

①

Isolate x^2 .

$$x^2 - 16 = 0$$

②

Take the **SQUARE ROOT** of both sides.

REMEMBER THAT A POSITIVE NUMBER HAS TWO SQUARE ROOTS!

YOU TRY!

Directions: Solve the following quadratic equations by square roots.

1. $x^2 - 16 = 0$

2. $x^2 - 25 = 0$

3. $x^2 + 5 = 0$

4. $x^2 + 7 = 88$

5. $x^2 - 4 = 0$

6. $6x^2 = 54$

7. $-2x^2 = -98$

8. $\frac{3}{4}x^2 = 48$

9. $3x^2 - 108 = 0$

10. $5x^2 - 45 = 0$

$$11. 7x^2 + 66 = 3$$

$$12. \frac{1}{2}x^2 + 3 = 75$$

$$13. 9x^2 - 16 = 0$$

$$14. 25x^2 + 10 = 46$$

$$15. 5x^2 - 1 = x^2$$

$$16. 16x^2 - 34 = 15$$

IRRATIONAL SOLUTIONS

Zeros can be irrational! Solve the following quadratic equations.
Write answers in simplified radical form.

$$17. x^2 - 3 = 0$$

$$18. x^2 - 8 = 0$$

$$19. x^2 = 56$$

$$20. x^2 - 16 = 59$$

$$21. 2x^2 - 126 = 0$$

$$22. 8 - 3x^2 = -22$$

$$23. -x^2 - 10 = 18$$

$$24. \frac{1}{2}x^2 - 11 = 25$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 7: Solving Quadratics
by Square Roots

**** This is a 2-page document! ****

Solve each quadratic equation by the square roots method. Simplify all irrational solutions.

1. $x^2 - 64 = 0$

2. $2x^2 - 18 = 0$

3. $5x^2 - 20 = 0$

4. $x^2 + 81 = 0$

5. $x^2 - 24 = 57$

6. $x^2 - 22 = 28$

7. $\frac{2}{3}x^2 = 5$

8. $\frac{1}{4}x^2 - 1 = 15$

9. $x^2 - 25 = 0$

10. $9x^2 = 49$

11. $81x^2 = 4$

12. $2x^2 - 7 = -7$

13. $4x^2 + 11 = 12$

14. $49x^2 - 3 = 13$

15. $x^2 - 6 = 0$

16. $x^2 = 150$

17. $2x^2 - 90 = 0$

18. $x^2 - 15 = 45$

19. $4x^2 - 323 = 0$

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

21. $\frac{x^2}{2} - 2 = 18$

22. $\frac{3}{2}x^2 + 11 = 71$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples													
WARM-UP: Perfect Square Trinomials	Factor the following trinomials:													
	$x^2 + 8x + 16 =$ _____ $x^2 + 2x + 1 =$ _____	$x^2 - 18x + 81 =$ _____ $x^2 - 10x + 25 =$ _____												
	These are called perfect square trinomials . If you have a perfect square trinomial, you can solve the quadratic equation by taking square roots!													
EXAMPLES	Directions: Factor the perfect square trinomial, then solve the equation by square roots. Remember a positive number always has two square roots, so you must solve for both cases.													
	1. $x^2 + 4x + 4 = 25$	2. $x^2 - 2x + 36 = 25$												
	3. $x^2 - 10x + 49 = 4$	4. $x^2 + 6x + 9 = 1$												
COMPLETING THE SQUARE (when $a = 1$)	When you do not have a perfect square trinomial, you can create one. This process is called completing the square . Follow the steps below to solve the equation by completing the square.													
	<table><tr><th colspan="2">Steps</th><th>Example</th></tr><tr><td>1</td><td>Rewrite as $x^2 + bx = c$</td><td rowspan="4">$x^2 + 8x + 7 = 0$</td></tr><tr><td>2</td><td>Take half of b, square it, then add this to both sides.</td></tr><tr><td>3</td><td>Factor the perfect square trinomial.</td></tr><tr><td>4</td><td>Take the square root of both sides and solve for both cases.</td></tr></table>		Steps		Example	1	Rewrite as $x^2 + bx = c$	$x^2 + 8x + 7 = 0$	2	Take half of b , square it, then add this to both sides.	3	Factor the perfect square trinomial.	4	Take the square root of both sides and solve for both cases.
	Steps		Example											
	1	Rewrite as $x^2 + bx = c$	$x^2 + 8x + 7 = 0$											
	2	Take half of b , square it, then add this to both sides.												
	3	Factor the perfect square trinomial.												
4	Take the square root of both sides and solve for both cases.													

YOU TRY!

Directions: Solve each equation by completing the square.

5. $x^2 - 12x + 27 = 0$

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

7. $x^2 + 71 = 18x - 9$

8. $x^2 + 2x - 50 = -4$

**IRRATIONAL
SOLUTIONS**

Directions: Solve each equation by completing the square. Simplify all irrational solutions.

9. $x^2 - 2x - 4 = 0$

10. $x^2 + 16x + 46 = 0$

11. $x^2 + 7x + 7 = 66 - x$

12. $x^2 - 2 = 6x - 3$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 8: Solving Quadratics by
Completing the Square (Day 1)

**** This is a 2-page document! ****

Factor the perfect square trinomial, then solve the quadratic equation by square roots.

1. $x^2 + 18x + 81 = 1$

2. $x^2 - 10x + 25 = 64$

3. $x^2 - 16x + 64 = 4$

4. $x^2 + 2x + 1 = 4$

Solve each quadratic equation by completing the square. Simplify all irrational solutions.

5. $x^2 - 6x - 16 = 0$

6. $x^2 - 20x + 19 = 0$

7. $x^2 + 14 = 46$

8. $x^2 + 14x + 32 = -8$

9. $x^2 + 41 = 12x + 9$

10. $x^2 + 8x - 12 = 21$

11. $x^2 - x - 22 = x - 7$

12. $x^2 + 10x + 21 = 5$

13. $x^2 - 16x + 74 = 2x$

14. $x^2 = 8x - 4$

15. $x^2 - 7 = 2x$

16. $x^2 + 12 = 38 - 16x$

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

COMPLETING THE SQUARE

(when $a > 1$)

Steps

- 1 Rewrite as $ax^2 + bx = c$
- 2 Divide the equation by a .
- 3 Take half of b , square it, then add this to both sides.
- 4 Factor the perfect square trinomial.
- 5 Take the square root of both sides and solve for x .

Example

$$4x^2 + 12x - 7 = 0$$

YOU TRY!

Directions: Solve each equation by completing the square.

1. $2x^2 - 8x + 6 = 0$

2. $3x^2 - 18x - 48 = 0$

3. $5x^2 + 10x - 34 = 6$

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

$$5. 3x^2 - 24x - 44 = 1 - x^2$$

$$6. 8x^2 + 16x = 90$$

IRRATIONAL SOLUTIONS

Directions: Solve each equation by completing the square. Simplify all irrational solutions.

$$7. 2x^2 - 16x + 22 = 0$$

$$8. 4x^2 - 12x + 9 = 0$$

$$9. x^2 - 6x - 3 = 90$$

$$10. 5x^2 + 30x - 4 = 16$$

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

Homework 9: Solving Quadratics by
Completing the Square (Day 2)

**** This is a 2-page document! ****

Solve each quadratic equation by completing the square. Simply all irrational solutions.

1. $3x^2 - 36x + 81 = 0$

2. $8x^2 + 16x - 24 = 0$

3. $2x^2 - 12x - 65 = 45$

4. $6x^2 + 12x - 18 = 0$

5. $5x^2 - 24x + 14 = 0$

6. $8x^2 + 36x + 30 = 10 - x^2$

7. $10x^2 - 20x - 10 = 0$

8. $2x^2 - 16x - 50 = 16$

9. $4x^2 + 42x = 2x - 8$

10. $x^2 + 36x + 324 = 0$

11. $2x^2 - 11x + 12 = 78 - 3x$

12. $5x^2 = 40x + 5$

Name: _____

Algebra I

Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-3: Solving Quadratics by Square Roots and Completing the Square

Solve each equation by square roots. Simplify all irrational solutions.

1. $x^2 - 81 = 0$

2. $5x^2 + 2 = 7$

3. $\frac{1}{8}x^2 - 9 = -7$

4. $9x^2 + 17 = -1$

5. $3x^2 - 11 = 49$

6. $8 - 2x^2 = -82$

For each equation, write the perfect square trinomial, then solve the equation by square roots.

7. $x^2 - 12x + 36 = 49$

8. $x^2 - 2x + 1 = 25$

Solve each equation by completing the square. Simplify all irrational solutions.

9. $x^2 - 4x - 32 = 0$

10. $x^2 + 6x + 13 = 5$

11. $x^2 + 14x + 47 = 0$

12. $x^2 = 20x - 92$

13. $3x^2 - 24x = 60$

14. $8x^2 - 12x + 5 = 0$

15. $5x^2 - 12x - 35 = 0$

16. $3x^2 + 12x = x^2 + 30$

9. _____

10. _____

11. _____

13. _____

14. _____

15. _____

16. _____

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

THE QUADRATIC FORMULA

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

The quadratic formula is another method to use to solve a quadratic equation. Solve the equation below using the quadratic formula.

Steps

Example

①

Make sure the equation is set equal to 0 and written in **standard form**.

②

Identify **a**, **b**, and **c**.

③

Substitute these values into the formula and **SIMPLIFY**!

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

YOU TRY!

Directions: Solve each equation using the quadratic formula.

1. $x^2 - 8x = 20$

2. $2x^2 + 7x + 3 = 12$

3. $3x^2 - 12x + 8 = 0$

4. $x^2 + 15x = 6x$

5. $-x^2 - 10x - 21 = 0$

6. $4x^2 + 9x = 12x$

$$7. x^2 + 7x = x - 10$$

$$8. 3x^2 - 5x = 4 - 3x^2$$

IRRATIONAL SOLUTIONS

Directions: Solve each equation using the quadratic formula. List all irrational solutions in simplest radical form.

$$9. x^2 + 4x + 1 = 0$$

$$10. -x^2 - 4x + 7 = 0$$

$$11. x^2 + 9 = 20$$

$$12. 4x^2 - 7x = -2$$

$$13. x^2 + 3 = 8x - x^2$$

$$14. 3x^2 - 6x = 12$$

Name: _____

Unit 8: Quadratic Equations



Date: _____ Bell: _____

Homework 10: Solving Quadratics by
The Quadratic Formula

**** This is a 2-page document! ****

Solve each quadratic equation by the quadratic formula.
Simplify all irrational solutions.

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

1. $x^2 - 2x - 48 = 0$

2. $6x^2 - 15x = 0$

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

4. $x^2 + 4x + \quad = -2x$

5. $\quad = 0$

6. $6x^2 + 18x = x - 12$

7. $x^2 + 2x = 3 - 2x$

8. $-x^2 + 7x - 18 = 0$

9. $2x^2 - 8x - 2 = 3$

10. $x^2 - 19$

11. $4x^2$

12. $2x^2 + 12x = 4 - x^2$

SOLVING QUADRATICS REVIEW

METHOD I: FACTORING

1. $x^2 - 6x - 40 = 0$

2. $x^2 - 14x + 49 = 0$

3. $10x^2 - 25 = x^2$

4. $12x^2 + 8x = 0$

5. $2x^2 + 80 = 26x$

6. $4x^2 + 5x + 1 = 0$

METHOD II: QUADRATIC FORMULA

7. $x^2 = 225$

8. $4x^2 - 1 = 48$

9. $x^2 - 10x + 25 = 0$

10. $\frac{3}{4}x^2 + 1 = 31$

METHOD 3: COMPLETING THE SQUARE

11. $x^2 - 18x + 65 = 0$

12. $x^2 + 16x + 55 = 3$

13. $2x^2 + 9x = x - 14$

14. $9x^2 = 18x +$

METHOD 4: QUADRATIC FORMULA

15. $x^2 + 12x - 24 = 0$

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

18. $3x^2 - 9x = x - 5$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 11: Solving Quadratics Review

**** This is a 2-page document! ****

Solve each equation by factoring.

1. $x^2 + x - 42 = 0$

2. $4x^2 + 24x + 36 = 0$

3. $14x^2 + 6x = 2x$

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

5. $3x^2 + 23x - 8 = 0$

6. $3x^2 = 3 + 2x$

Solve each equation by square roots.

7. $x^2 + 4 = 2$

8. $9x^2 - 1 = 0$

9. $27x^2 - 53 = 0$

10. $\frac{2}{3}x^2 - 16 = 32$

Solve each equation by completing the square.

11. $x^2 + 8x - 33 = 0$

12. $x^2 - 57 = 2x + 5$

13. $-x^2 + 15x = 73 - 3x$

14. $x^2 + 8x - 15 = 0$

Solve each equation using the quadratic formula.

15. $-x^2 + 6x - 5 = 0$

16. $8x^2 - 3 = 8x + 10$

SOLVING QUADRATIC EQUATIONS: Methods Comparison

FACTORING

COMPLETING THE SQUARE

QUADRATIC FORMULA

1 $x^2 - 14x + 48 = 0$

2 $x^2 + 19 = 4 - 8x$

3 $2x^2 + 4x = 48$

PREVIEW

	FACTORING	COMPLETING THE SQUARE	THE QUADRATIC FORMULA
4	$-x^2 - 6x + 16 = 0$		
5	$9x^2 - 18x = 7$		
6	$3x^2 + 16x - 64 = 1 - x^2$		

PREVIEW

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples	
Choosing the BEST METHOD	METHOD	BEST USED WHEN
	FACTORING	
	SQUARE ROOTS	
	COMPLETING THE SQUARE	
	QUADRATIC FORMULA	
When is it FACTORABLE?		
EXAMPLES (HINT: Use the discriminant to determine if it's factorable!)	Directions: Choose a method to solve each equation below. You can only use each method once.	
	1. $x^2 - 6x + 7 = 73$ ☐ F ☐ SR ☐ CS ☐ QF	$x^2 - 4 = 0$ ☐ F ☐ SR ☐ CS ☐ QF
	3. $2x^2 + 8x + 10 = 3$ ☐ F ☐ SR ☐ CS ☐ QF	4. $x^2 + 9x + 14 = 0$ ☐ F ☐ SR ☐ CS ☐ QF

Directions: Solve each equation below using your method of choice. Simplify all irrational solutions.

5. $x^2 - 2x = 4$

6. $10x^2 + x - 2 = 0$

7. $5x^2 - 15x - 50 = 0$

8. $36x^2 = 9x$

9. $-x^2 + 16x - 63 = 0$

10. $x^2 + 10x = 4$

11. $6x^2 - 32 = 0$

12. $4x^2 = 4x + 7$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 12: Solving Quadratics by
Method of Choice

**** This is a 2-page document! ****

Solve each equation by factoring, square roots, completing the square, or the quadratic formula. Simplify all irrational solutions.

1. $x^2 + 11x + 28 = 0$

2. $10x^2 - 12x = 0$

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

$x = 32$

5. $10x^2 - x - 3 = 0$

6. $3x^2 - 36 = 12x$

$x^2 + 12x - 54 = 0$

8. $7 - 2x^2 = -47$

9. $6x^2 = x^2 + 5x$

10. $4x^2 - 2x + 1 = 2x$

11. $3x^2 - 5x = 14 - 4x$

12. $\frac{2}{3}x^2 - 7 =$

13. $4x^2 - 6x + 1 = 6$

$-2x^2 + 24x - 24 = 0$

$4 - 16x = 16$

16. $9x^2 - 6x + 10 = 11$

Name: _____

Algebra I

Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-4: Solving Quadratic Equations (All Methods)

Choose a method to solve each equation. You may only choose each method once.

1. $-x^2 + 25 = 0$

- ☐ F
- ☐ SR
- ☐ CS
- ☐ QF

2. $2x^2 - 14x - 60 = 0$

- ☐ F
- ☐ SR
- ☐ CS
- ☐ QF

1. _____

3. _____

4. _____

3. $x^2 + 6x - 71 = 0$

- ☐ F
- ☐ SR
- ☐ CS
- ☐ QF

4. $4x^2 - 12x + 9 = 0$

- ☐ SR
- ☐ CS
- ☐ QF

Solve each equation using your method of choice.

5. $x^2 - 27 = 0$

6. $2x^2 - 4x - 14 = 0$

5. _____

6. _____

7. $4x^2 - 15 = 66$

8. $6x^2 + 12x = 5x + 3$

9. $-x^2 - 36 = 14x + 1$

10. $50 - \frac{1}{2}x^2 = 23$

11. $6x^2 - 14x = 0$

12. $7 - x^2$

BONUS: $(2x - 7)(x + 10)(x - 5)$

7. _____

8. _____

9. _____

10. _____

11. _____

B. _____

Name:

Date:

Topic:

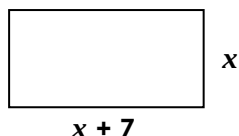
Class:

Main Ideas/Questions

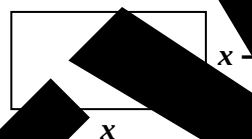
Notes/Examples

AREA Problems

1. Given the diagram below, find the value of x if the area of the rectangle is 78 square meters.



2. Given the diagram below, find the dimensions of the rectangle if the area of the rectangle is 100 square meters.



3. Find the dimensions of the rectangle below if the area is 128 square feet.



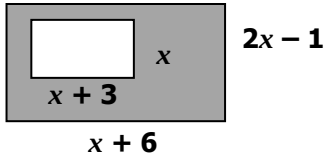
4. The dimensions of a rectangle can be expressed as $x + 3$ and $x - 8$. If the area of the rectangle is 60 square inches, find the value of x .

5. The length of a rectangular garden is 4 meters more than its width. The area of the rectangle is 60 meters. Find the dimensions of the garden.

6. The length of a rectangle is 6 meters less than its width. Find the dimensions of the rectangle if its area is 27 square meters.

7. A square is altered so that one dimension is increased by 5 inches and the other dimension is decreased by 2 inches. If the area of the resulting rectangle is 98 square inches, find the area of the original square.

8. Given the diagram to the left, if the area of the shaded rectangle is 24 square inches, what are the dimensions of the outside rectangle?



9. The product of two positive consecutive integers is 10. Find the integers.

10. The sum of two positive consecutive even integers is 80. Find the integers.

CONSECUTIVE INTEGER Problems

11. Find three positive consecutive integers such that the square of the first, added to 3 times the second, is 24.

12. Find three positive consecutive integers such that the product of the second integer and the third integer is 72.

Name: _____

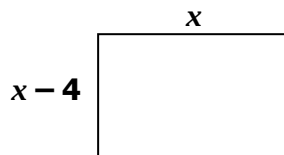
Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 13: Quadratic Equation
Word Problems

**** This is a 2-page document! ****

1. Given the diagram below, find the value of x if the area is 21 square meters.



2. The dimensions of a rectangle can be expressed by $x + 7$ and $x + 2$. If the area of the rectangle is 66 square inches, what are the dimensions of the rectangle?

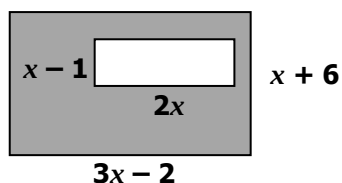
3. The length of a rectangle is 6 meters more than its width. If the area of the rectangle is 135 square meters, find its dimensions.

4. The length of a rectangle is 1 meter less than its width. The area of the rectangle is 42 square meters. Find the dimensions of the rectangle.

5. The length of a rectangle is 3 feet less than twice its width. The area of the rectangle is 70. Find the dimensions of the rectangle.

6. The dimensions of a square are altered so that one dimension is increased by 7 feet and the other is decreased by 2 feet. The area of the resulting rectangle is 90 square feet. Find the original area of the square.

7. If the area of the shaded region in the diagram below is 103 square feet, what are the dimensions of the inside rectangle?



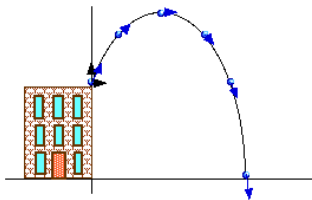
8. The side length of a square can be expressed as $2x + 3$. If the area of the square is 121 square meters, what is the value of x ?

9. The product of two positive consecutive integers is 132. Find the integers.

10. Find two positive even consecutive integers such that the square of the smaller integer is 10 more than the larger integer.

11. Find three positive consecutive integers such that the product of the first and the third integer is 17 more than the second integer.

12. Find two positive consecutive odd integers such that the square of the larger integer is one less than twice the square of the small integer.



PROJECTILE MOTION Problems

1. A soccer ball is kicked from the ground with an initial upward velocity of 90 feet per second. The equation $h = -16t^2 + 90t$ gives the height h of the ball after t seconds.

a. Find the maximum height of the ball.

b. How many seconds will it take for the ball to reach the ground?

1a. _____

2a. _____

b. _____

2. An apple is launched directly upward at 64 feet per second from an 80-foot tall platform. The equation for this apple's height after time t seconds after launch is $h = -16t^2 + 64t + 80$.

a. Find the maximum height of the apple.

b. How many seconds will it take for the apple to reach the ground?

3a. _____

b. _____

3. In science class, you are asked to create a container to hold an egg. You drop this container from a window that is 25 feet above the ground. If the equation of the container's pathway can be modeled by the equation $h = -16t^2 + 25$, how long will it take the container to reach the ground?

a. Find the maximum height of the container.

b. How many seconds will it take for the container to reach the ground?

4. A penny is dropped off the Empire State Building, which is 1,250 feet tall. If the penny's pathway can be modeled by the equation $h = -16t^2 + 1250$, how long would it take the penny to strike a 6-foot tall person?

4. _____

5. Some fireworks are fired vertically into the air from the ground at an initial speed of 80 feet per second. The equation for this object's height h at time t seconds after launch is $h = -16t^2 + 80t$. How long will it take the fireworks to reach the ground?

5. _____

6. The Apollo's Chariot, a roller coaster at Busch Gardens, moves at an initial speed of 80 feet per second. The equation of the ride can be modeled by the equation $h = -16t^2 + 101t + 10$. What is the maximum height reached by this ride?

6. _____

7. Eva is jumping on a trampoline. Her height can be modeled by the equation $h = -16t^2 + 20t + 10$. Would Eva reach a height of 14 feet?

7. _____

8. An astronaut on the Moon throws a baseball upward with an initial velocity of 10 meters per second, letting go of the baseball 2 meters from the ground. The equation of the baseball pathway can be modeled by $h = -0.8t^2 + 10t + 2$. The same experiment is done on Earth, in which the pathway is modeled by equation $h = -4.9t^2 + 10t + 2$. How much longer would the ball stay in the air on the Moon compared to on Earth?

8. _____

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 14: Projectile Motion

1. When a cannonball is fired, the equation of its pathway can be modeled by $h = -16t^2 + 128t$.

a) Find the maximum height of the cannonball.

b) Find the time it will take for the cannonball to reach the ground.

2. When Joey dives off a diving board, the equation of his pathway can be modeled by $h = -16t^2 + 15t + 12$.

a) Find Joey's maximum height.

b) Find the time it will take for Joey to reach the water.

3. A toy rocket is launched from a platform that is 48 feet above the ground. The rocket's height above the ground is modeled by $h = -16t^2 + 32t + 48$.

a) Find the maximum height of the rocket.

b) Find the time it will take for the rocket to reach the ground.

At the end of the school year, Rachel and Amber threw their Algebra textbooks off the top of a 12-story building. The equation of the pathway of each book is given below. By how many seconds does Rachel's textbook beat Amber's textbook to the ground?

Rachel: $h = -16t^2 + 36t + 160$

Amber: $h = -16t^2 + 50t + 160$

Name:

Date:

Topic:

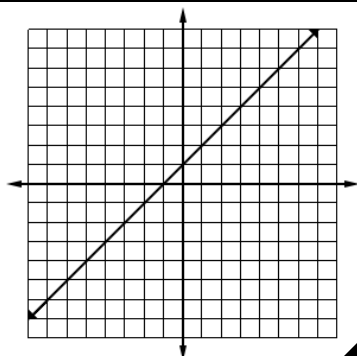
Class:

Main Ideas/Questions

Notes/Examples

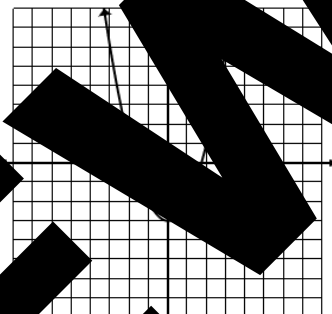
LINEAR vs.
QUADRATIC
Models

LINEAR



Equation:

QUADRATIC



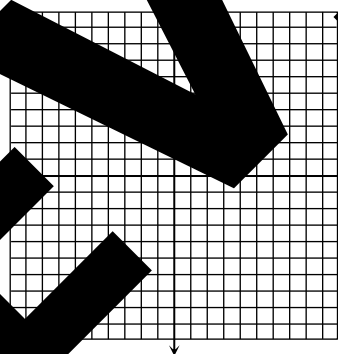
Equation:

Writing
EQUATIONS

Directions: Use a graph to determine the model. Then, write an equation to represent the data.

1.

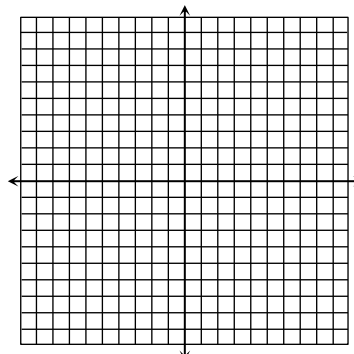
x	y
-5	2
-3	-1
5	2



Linear or Quadratic? _____

Equation: _____

x	y
-3	2
-2	-1
-1	-2
0	-1
1	2

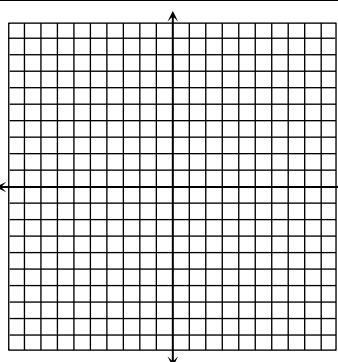


Linear or Quadratic? _____

Equation: _____

3.

x	y
1	-5
2	-2
3	-1
4	-2
5	-5

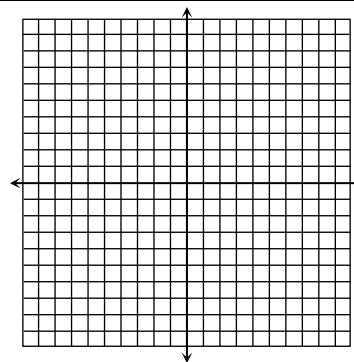


Linear or Quadratic? _____

Equation: _____

4.

x	y
-4	7
-2	6
0	5
2	4
4	3

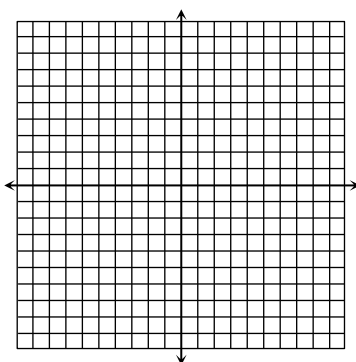


Linear or Quadratic? _____

Equation: _____

5.

x	y
-2	-2
-1	1
0	4
1	7
2	10

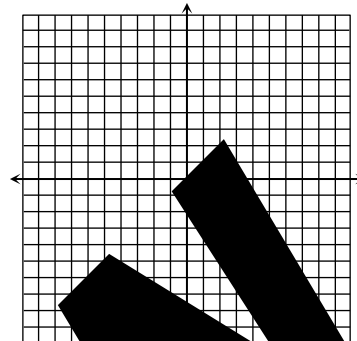


Linear or Quadratic? _____

Equation: _____

6.

x	y
-4	11
-2	6
0	1
2	-4
4	-9

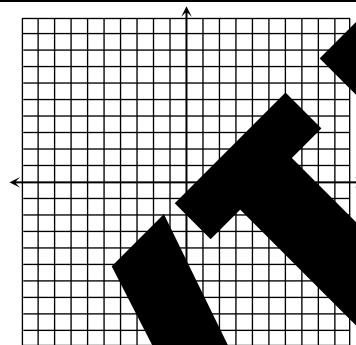


Linear or Quadratic? _____

Equation: _____

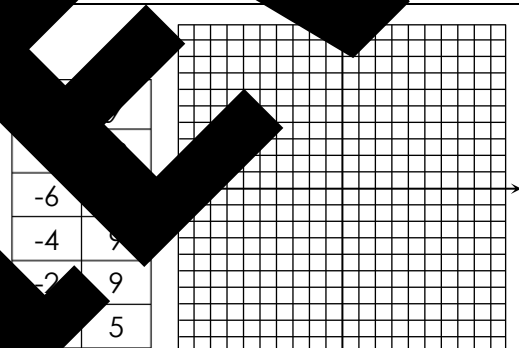
7.

x	y
0	1
1	-4
2	-5
3	-2
4	5



Linear or Quadratic? _____

Equation: _____



Linear or Quadratic? _____

Equation: _____

Making
PREDICTIONS

The value of a computer between 1999 and 2003 is given in the table below. Write an equation for the **line of best fit**, then predict the value of the computer in 2008.

t	1999	2000	2001	2002	2003
v	800	720	640	572	480

10. A coin is thrown off the top of the Statue of Liberty, which is 305 feet from the ground. The height, h , of the coin is recorded after each second, t , in the table below. Write an equation for the **curve of best fit**, then predict the height of the coin after 7 seconds.

t	h
0	305
1	367
2	397
3	395
4	361

Name: _____

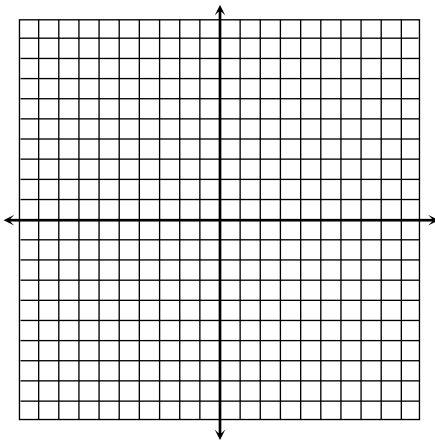
Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 15: Linear and Quadratic Models

**** This is a 2-page document! ******Determine if a linear or quadratic model exists. Then, find the equation for best fit.****1.**

x	y
-2	3
-1	6
0	7
1	6
2	3

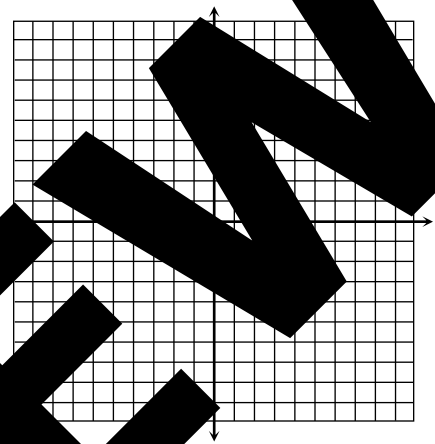


Linear or Quadratic? _____

Equation: _____

2.

x	y
-6	2
-3	3
0	4
3	5
6	6

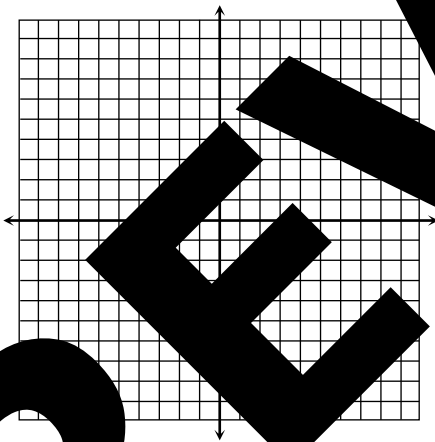


Linear or Quadratic? _____

Equation: _____

3.

x	y
-5	10
-3	6
0	0
2	-4
4	-8

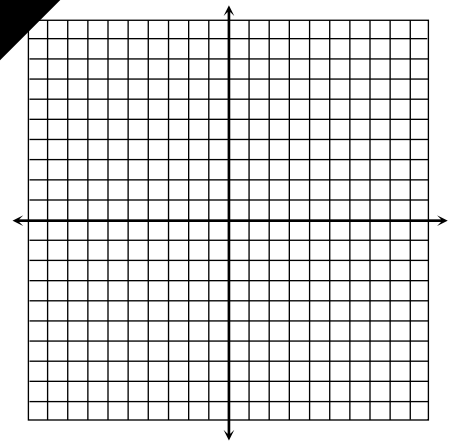


Linear or Quadratic? _____

Equation: _____

4.

x	y
8	-1
-6	-7
-4	-9
-2	-7
0	-1



Linear or Quadratic? _____

Equation: _____

1. A statistician is trying to determine the relationship between the distance a 3-bedroom home is from New York City and its average selling price. He records the data for 6 homes in the table below. Write the equation for the line of best fit, then approximate the cost of a home located 90 miles from New York City.

x	10	35	50	65	75	120
y	35,000	650,000	580,000	505,000	475,000	285,000

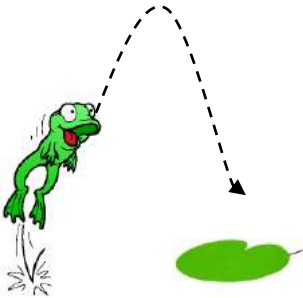
* x = miles from NYC; y = cost of home

6. A football is kicked into the air with an initial upward velocity of 82 feet per second. Its height, h (in feet), is recorded at various seconds, t , in the table below. Write an equation for the curve of best fit, then estimate the height of the football after 5 seconds.



t	h
0	0
1	66
2	100
3	102
4	72

7. A frog is jumping onto a lily pad. Its height, h (in feet), is recorded at various seconds, t , in the table below. Write an equation for the curve of best fit, then estimate the height of the frog after 6 seconds.



t	h
0	2
1	4.5
2	6
3	6.5
4	6

8. The table below shows the number of students enrolled at Mapleton High School since 2002. Write an equation for the line of best fit, then predict the number of students enrolled in 2011.



Year	Enrollment
2002	3042
2003	3050
2004	3080
2005	3136
2006	3196

9. A traffic study was conducted on a busy street. In 15-minute intervals from 6:30 a.m. to 8:00 a.m., the number of vehicles that passed a certain point in one minute was recorded in the table below. Write an equation for the curve of best fit, then approximate the number of cars that passed the same point at 9:15 a.m.

x	0	15	30	45	60	75	90
y	32	48	71	80	98	86	81

* x = minutes past 6:30 a.m.; y = number of cars

entrance ticket

Name: _____

Determine if the following data represents a linear or quadratic model. Then, using the equation for the line or curve of best fit, solve for the missing value.

1. The local theater puts on an annual play. The table below shows the number of auditions for the lead role each year since 2004. Using an equation to model the data, approximate the number of auditions that will be held in 2013.

Year	Auditions
2004	21
2005	23
2006	26
2007	34
2008	38
2009	39
2010	41

2. A toy rocket was fired into the air. The height, h , of the rocket at time t seconds is recorded in the table below. Using an equation to model the data, find the height of the rocket after 5 seconds.

t (sec)	h (ft)
0	0
1	76
2	120
3	132
4	112

entrance ticket

Name: _____

Determine if the following data represents a linear or quadratic model. Then, using the equation for the line or curve of best fit, solve for the missing value.

1. The local theater puts on an annual play. The table below shows the number of auditions for the lead role each year since 2004. Using an equation to model the data, approximate the number of auditions that will be held in 2013.

Year	Auditions
2004	21
2005	23
2006	26
2007	34
2008	38
2009	39
2010	41

2. A toy rocket was fired into the air. The height, h , of the rocket at time t seconds is recorded in the table below. Using an equation to model the data, find the height of the rocket after 5 seconds.

t (sec)	h (ft)
0	0
1	76
2	120
3	132
4	112

Unit 8 Test Study Guide

(Quadratic Equations)

Name: _____

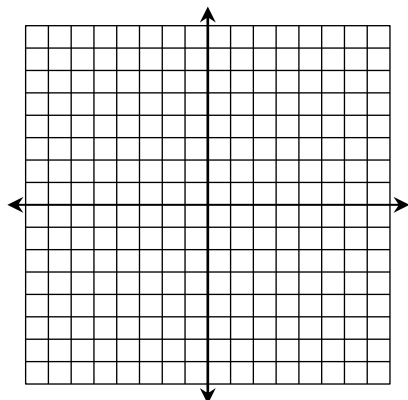
Date: _____ Per: _____

Topic 1: Graphing Quadratic Equations (from Standard Form and Vertex Form)

Graph each equation using a table of values. Identify all key characteristics.

1. $y = x^2 - 2x - 5$

x	y



Axis of Symmetry:

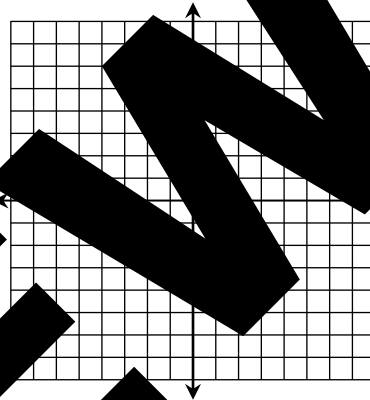
Vertex:

Domain:

Range:

2. $y = -x^2 + 10x - 28$

x	y



Axis of Symmetry:

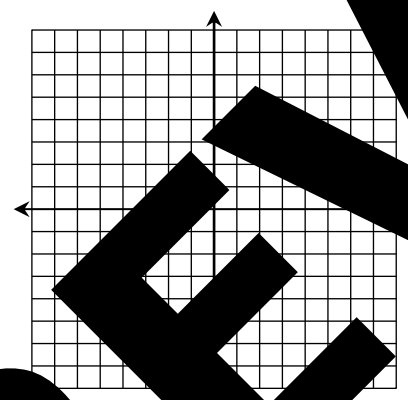
Vertex:

Domain:

Range:

3. $y = 2x^2 + 4x$

x	y



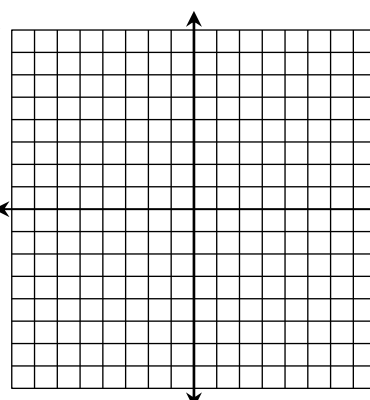
Axis of Symmetry:

Vertex:

Domain:

4. $y = -x^2 + 6x - 8$

x	y



Axis of Symmetry:

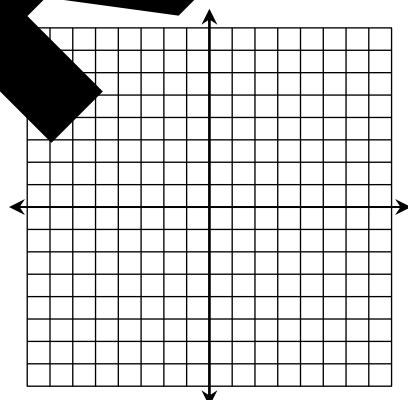
Vertex:

Domain:

Range:

5. $y = (x + 3)^2$

x	y



Axis of Symmetry:

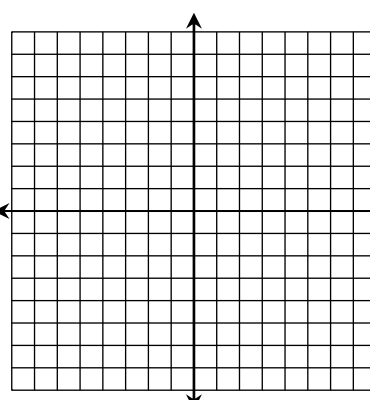
Vertex:

Domain:

Range:

6. $y = -3(x - 1)^2$

x	y



Axis of Symmetry:

Vertex:

Domain:

Range:

Topic 2: Vertex Form & Transformations

Describe the transformations from the parent function given each equation.		
7. $y = -x^2 + 6$	8. $y = (x + 4)^2 - 1$	9. $y = 2(x - 5)^2 + 4$
10. If the graph of the function $y = x^2$ is reflected over the x -axis, then translated two units left, write an equation to represent the function.	11. If the graph of the function $y = x^2$ is reflected over the y -axis, compressed by a factor of $\frac{1}{4}$, and translated seven units right and one unit down, write an equation to represent the function.	

Topic 3: Quadratic Roots (Zeros)

Graph each function, identify the zeros, then write the equation in factored form, if possible.		
12. $y = x^2 + 8x + 15$	13. $y = -2x^2 + 8x - 6$	14. $y = x^2 - 1$
Zeros:	Zeros:	Zeros:
Factored Form:	Factored Form:	Factored Form:
Write each equation in factored form. Then, identify the zeros.		
15. $y = (x - 4)^2 - 4$	16. $y = 2(x - 3)^2 - 18$	17. $y = -(x + 5)^2 + 9$
Factored Form:	Factored Form:	Factored Form:
Zeros:	Zeros:	Zeros:

Find the discriminant of each equation. Then, determine the number of solutions.		
18. $y = -x^2 + 7x - 15$	☐ 2 ☐ 1 ☐ $\emptyset$	19. $y = 3x^2 - 12x$ ☐ 2 ☐ 1 ☐ $\emptyset$
		20. $y = x^2 - 20x + 100$ ☐ 2 ☐ 1 ☐ $\emptyset$

Topic 4: Solving Quadratic Equations

Solve each equation. Simplify all irrational solutions.

21. $x^2 + 4x - 45 = 0$	22. $2x^2 - 9 = 39$
23. $x^2 - 10x - 3 = 0$	24. $16x^2 = 10x$
25. $5x^2 - 8 = 0$	26. $-x^2 + 3x = x - 19$

27. $x^2 - 2x - 17 = 0$

28. $6x^2 = 7x + 5$

29. $2x^2 + 19 = 1 - 20x$

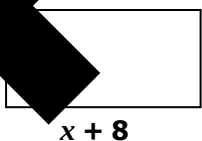
30. $25x^2 + 1 = 5$

31. $\frac{1}{2}x^2 - 42 = 8$

$x^2 + 9x + 13 = 4$

Topic 5: Quadratic and Consecutive Integer Problems

If the area of the rectangle below is 42 inches squared, find the value of x .



34. The length of a rectangle is five feet less than its width. If the area of the rectangle is 84 square feet, find its dimensions.

35. A square was altered so that one side is increased by 9 inches and the other side is decreased by 2 inches. The area of the resulting rectangle is 60 square inches. What was the area of the original square?

36. Find two consecutive positive integers such the sum of their squares is 145.

Topic 6: Projectile Motion

37. Natalie found a tennis ball outside a tennis court. She picked up the ball and threw it over the fence into the court. The path of the ball can be represented by the equation $-16t^2 + 18t + 5$.

- a.** Find the maximum height of the tennis ball. **b.** How long will it take to reach the ground?

38. A circus acrobat is shot out of a cannon with an upward speed of 50 ft/s. The equation for the acrobat's pathway can be modeled by the equation $-16t^2 + 50t + 4$.

- a.** Find the maximum height of the acrobat. **b.** How long will it take to reach the ground?

Topic 7: Linear and Quadratic Models

Recorded the time it took six children of different ages to run one lap around the track. Write an equation for the line of best fit, then estimate the length of time it would take for her old brother to run one lap.

Age (s)	Time (s)
10	180
11	137
12	126
12	124
15	102
16	78

40. A pistol is accidentally discharged vertically in the air. The height, h , of the bullet at time t seconds is recorded in the table below. Using an equation for the curve of best fit, find the height of the bullet after 10 seconds.

t (s)	h (ft)
0	3
1	187
2	339
3	459
4	547

Name: _____

Date: _____ Per: _____

Algebra I Unit 8 Test

Quadratic Equations

Find the axis of symmetry and vertex for the following equations.

1. $y = -x^2 - 4x + 1$

Axis of Symmetry

Vertex

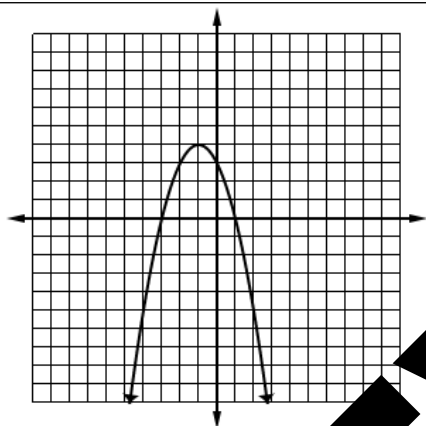
2. $y = 2x^2 + 8$

Axis of Symmetry

Vertex

Complete each part using the given graph.

3.



Axis of Symmetry

Vertex

Domain

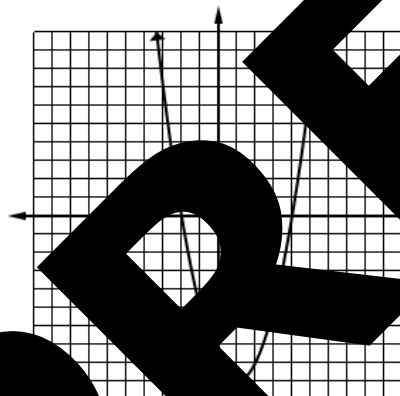
Range

Equation:

A. $y = -x^2 - 2x + 3$ C. $y = -x^2 + 2x + 3$

B. $y = x^2 - 2x + 3$ D. $y = -x^2 - 2x + 3$

4.



Axis of Symmetry

Vertex

Domain

Range

Zeros:

Equation: A. $y = (x - 1)^2 - 9$ C. $y = (x - 9)^2 + 1$

B. $y = (x + 1)^2 - 9$ D. $y = (x + 9)^2 + 1$

The graph of the function $y = x^2$ is reflected across the x-axis, then translated two units left and three units down, write an equation to represent the new function.

6. If the graph of the function $y = x^2$ is translated so its vertex is now at the point $(0, -3)$, which equation represents the new function?

A. $y = (x - 3)^2$

B. $y = (x + 3)^2$

C. $y = x^2 - 3$

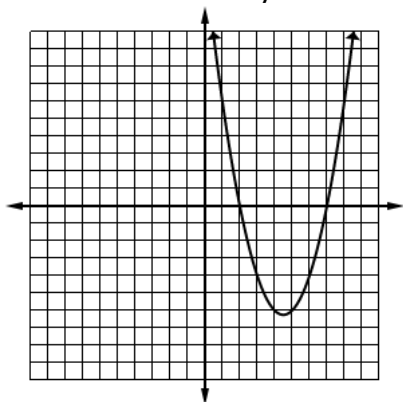
D. $y = x^2 + 3$

7. Given the function, check all transformations that occurred from the graph of the function $y = x^2$.

$$y = \frac{1}{3}(x + 7)^2 + 4$$

☐ up 7 units	☐ up 4 units	☐ vertical stretch
☐ down 7 units	☐ down 4 units	☐ vertical compression
☐ left 7 units	☐ left 4 units	☐ reflection in x -axis
☐ right 7 units	☐ right 4 units	☐ reflection in y -axis

8. Choosing from the binomial factors shown below, write the equation of the parabola shown to the right in factored form. Write your answers in the boxes.



☐ $x + 2$	☐ $x + 7$
☐ $x - 2$	☐ $x - 7$

$$y = (\quad)(\quad)$$

9. Write the equation below in standard form, then identify the zeros.

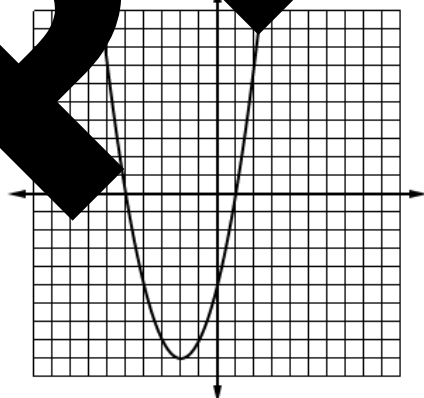
$$y = -(x - 1)^2 + 25$$

Standard Form:

Factored Form

Zeros:

10. Write the equation that represent the parabola graphed below.



☐ $y = (x - 5)(x + 1)$	☐ $y = x^2 - 4x - 5$
☐ $y = (x + 5)(x - 1)$	☐ $y = (x + 2)^2 - 9$
☐ $y = x^2 + 4x - 5$	☐ $y = (x - 2)^2 - 9$

11. Which quadratic equations have two solutions? Check all that apply.

☐ $y = x^2 - 8x - 20$	☐ $y = x^2 - 25$
☐ $y = x^2 + 3$	☐ $y = 4x^2 + 12x + 9$
☐ $y = -x^2 + 2x - 1$	☐ $y = -2x^2 - 5x - 4$

Solve each equation. Simplify all irrational solutions.

12. $x^2 + 10x = 24$

13. $4x^2 + 5 = 6$

14. $x^2 + 18x = 4x - 49$

$x^2 - 6x - 23 = 0$

17. $\frac{2}{3}x^2 + 15 = 23$

18. $5x^2 + 14x = x + 6$

19. $2x^2 - 10x + 11 = 0$

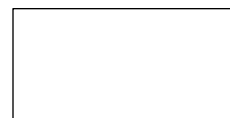
20. $4x^2 - 24 = 20x$

21. $x^2 + 8$

22. Which equation has solutions of -2 and 3?

- A. $y = x^2 + x - 6$
- B. $y = x^2 - x - 6$
- C. $y = x^2 + 5x + 6$
- D. $y = x^2 - 5x + 6$

23. If the area of the rectangle below is 39 square feet, find the value of x .



$x - 2$

$x + 8$

24. A square is altered so that one dimension is increased by 5 meters and the other dimension is increased by 3 meters. If the area of the resulting rectangle is 99 square meters, find the area of the original square.

25. The length of a rectangle is seven less than twice the length of its width. If the area of the rectangle is 15 square meters, find the value of x .

26. Find two consecutive positive integers such that the square of the larger integer is nineteen more than nine times the smaller integer.

27. April shoots an arrow upward at a speed of 80 feet per second from a platform 25 feet high. The pathway of the arrow can be represented by the equation $h = -16t^2 + 80t + 25$, where h is the height and t is the time. What is the maximum height of the arrow?

- A. 80 feet
- B. 90 feet
- C. 125 feet
- D. 140 feet

A rock is dropped from a bridge 320 feet above a river. The pathway that the rock takes can be represented by the equation $h = -16t^2 + 320$. How long will it take the rock to reach the river?

- A. 2.5 sec
- B. 3.5 sec
- C. 3.8 sec
- D. 4.5 sec

- 29.** The table shows student enrollment at a college by year. Write an equation for the line of best fit, then find the approximate enrollment for the year 2010.

x	y
1998	950
1999	995
2000	1011
2001	1020
2002	1035

- A. 1128 people
B. 1152 people
C. 1197 people
D. 1205 people

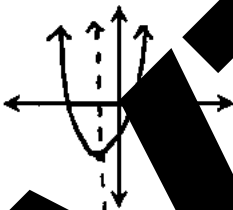
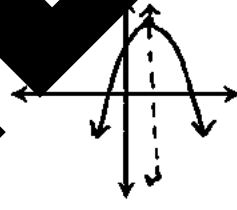
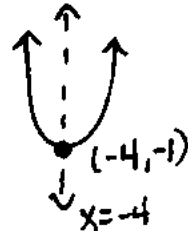
- 30.** The Sears Tower, at 1,451 feet, is one of the tallest structures in the United States. A penny is thrown from the top of the tower. The height, h , of the penny is recorded after each second, as shown in the table. Write an equation for the curve of best fit, then find the approximate height of the penny after 7 seconds.

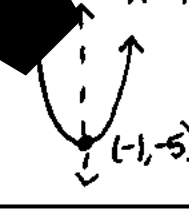
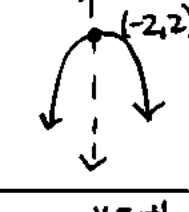
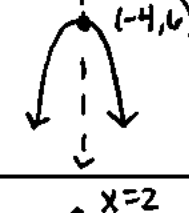
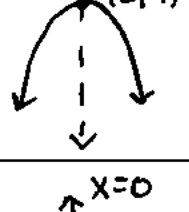
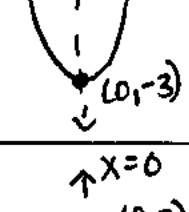
t	h
0	1451
1	1470
2	1457
3	1412
4	1334

- A. 907 feet
B. 912 feet
C. 923 feet
D. 928 feet

BONUS: Find the solution(s) to the quadratic equation below.

$$(x - 8)^2 - 3(x + 2) = 2(x + 9)$$

Name:		Date:	
Topic:		Class:	
Main Ideas/Questions	Notes/Examples		
Standard Form	Standard Form of a Quadratic Equation: $y = ax^2 + bx + c$		
Graph	When graphed, a quadratic equation creates a U-shaped curve called a <u>parabola</u> .		
Types of Parabolas	Use your graphing calculator to sketch the following. $y = x^2 + 2x - 5$ $y = -x^2 - 2x + 7$   - If 'a' is <u>positive</u>, then the parabola opens <u>up</u>. It's a smile. - If 'a' is <u>negative</u>, then the parabola opens <u>down</u>. It's a frown. ☹️		
Axis of Symmetry	The <u>axis of symmetry</u> is a line that divides the parabola into two equal parts. The formula for the axis of symmetry: $x = \frac{-b}{2a}$		
Vertex	The <u>vertex</u> is the turning point of the parabola. - When the vertex is the <u>lowest point</u>, it is called a <u>minimum</u>. - When the vertex is the <u>highest point</u>, it is called a <u>maximum</u>.		
Examples	Find the axis of symmetry and vertex, then sketch each parabola. 1. $y = x^2 + 8x + 15$ Axis of Symmetry: $x = -4$ Vertex: $(-4, -1)$ Sketch: $x = \frac{-8}{2(1)} = \frac{-8}{2} = -4$ $y = (-4)^2 + 8(-4) + 15$ $y = 16 - 32 + 15$ $y = -1$ 		

2. $y = -x^2 + 10x - 23$	Axis of Symmetry: $X = 5$ Vertex: $(5, 2)$ Sketch: $X = \frac{-(-10)}{2(-1)} = \frac{-10}{-2} = 5$ $y = (-5)^2 + 10(5) - 23$ $y = -25 + 50 - 23$ $y = 2$ 
3. $y = 3x^2 - 12x + 5$	Axis of Symmetry: $X = 2$ Vertex: $(2, -7)$ Sketch: $X = \frac{-(-12)}{2(3)} = \frac{12}{6} = 2$ $y = 3(2)^2 - 12(2) + 5$ $y = 12 - 24 + 5$ $y = -7$ 
4. $y = 4x^2 + 8x - 1$	Axis of Symmetry: $X = -1$ Vertex: $(-1, -5)$ Sketch: $X = \frac{-(-8)}{2(4)} = \frac{-8}{8} = -1$ $y = 4(-1)^2 + 8(-1) - 1$ $y = 4 - 8 - 1$ $y = -5$ 
5. $y = -x^2 - 4x - 2$	Axis of Symmetry: $X = -2$ Vertex: $(-2, 2)$ Sketch: $X = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$ $y = (-2)^2 - 4(-2) - 2$ $y = 4 + 8 - 2$ $y = 10$ 
6. $y = -3x^2 - 24x - 42$	Axis of Symmetry: $X = -4$ Vertex: $(-4, 6)$ Sketch: $X = \frac{-(-24)}{2(-3)} = \frac{24}{-6} = -4$ $y = -3(-4)^2 - 24(-4) - 42$ $y = -48 + 96 - 42$ $y = 6$ 
7. $y = -x^2 + 4x$	Axis of Symmetry: $X = 2$ Vertex: $(2, 4)$ Sketch: $X = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$ $y = -(2)^2 + 4(2)$ $y = -4 + 8$ $y = 4$ 
8. $y = x^2 - 6x + 9$	Axis of Symmetry: $X = 0$ Vertex: $(0, -3)$ Sketch: $X = \frac{-(-0)}{2(1)} = 0$ $y = (0)^2 - 6(0) + 9$ $y = 9$ 
9. $y = -2x^2 + 8x$	Axis of Symmetry: $X = 0$ Vertex: $(0, 8)$ Sketch: $X = \frac{-(-0)}{2(-2)} = 0$ $y = -2(0)^2 + 8(0)$ $y = 8$ 

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 1: Introduction to Quadratics

**** This is a 2-page document! ******Directions:** Complete the following statements.

- The standard form of a quadratic equation is $y = ax^2 + bx + c$.
- The curve formed by a quadratic equation is called a parabola.
- The formula for the axis of symmetry is $x = \frac{-b}{2a}$.
- If the vertex is the highest point on the graph, it is called a maximum.
- If a vertex is the lowest point on a graph, it is called a minimum.

Directions: Find the axis of symmetry and vertex for the following quadratic equations. Then, sketch the parabola and label all parts.

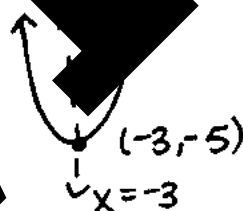
6. $y = x^2 + 6x + 4$

$$x = \frac{-(6)}{2(1)} = \frac{-6}{2} = -3$$

$$y = (-3)^2 + 6(-3) + 4 \\ = 9 - 18 + 4 = -5$$

Axis of Symmetry: $x = -3$ Vertex: $(-3, -5)$

Sketch:



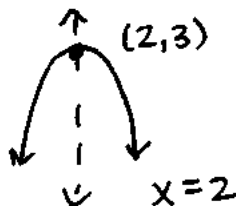
7. $y = -2x^2 + 8x - 5$

$$x = \frac{-8}{2(-2)} = \frac{-8}{-4} = 2$$

$$y = -2(2)^2 + 8(2) - 5 \\ = -8 + 16 - 5 = 3$$

Axis of Symmetry: $x = 2$ Vertex: $(2, 3)$

Sketch:



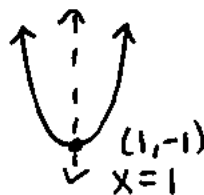
8. $y = x^2 - 2x - 1$

$$x = \frac{-(-2)}{2(1)} = \frac{2}{2} = 1$$

$$y = (1)^2 - 2(1) - 1 \\ = 1 - 2 - 1 = -1$$

Axis of Symmetry: $x = 1$ Vertex: $(1, -1)$

Sketch:



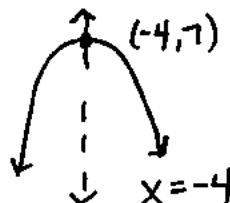
9. $y = -x^2 - 8x - 9$

$$x = \frac{-(-8)}{2(-1)} = \frac{8}{-2} = -4$$

$$y = -(-4)^2 - 8(-4) - 9 \\ = -16 + 32 - 9 = 7$$

Axis of Symmetry: $x = -4$ Vertex: $(-4, 7)$

Sketch:



10. $y = -5x^2 - 20x - 26$

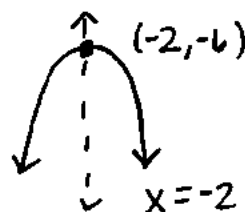
$$x = \frac{-(-20)}{2(-5)} = \frac{20}{-10} = -2$$

$$y = -5(-2)^2 - 20(-2) - 26 \\ = -20 + 40 - 26 = -6$$

Axis of Symmetry: $x = -2$

Vertex: $(-2, -6)$

Sketch:



11. $y = x^2 - 4$

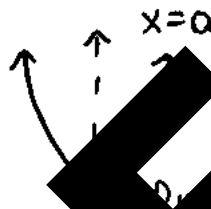
$$x = \frac{-(0)}{2(1)} = 0$$

$$y = 0^2 - 4 \\ = -4$$

Axis of Symmetry: $x = 0$

Vertex: $(0, -4)$

Sketch:



12. $y = -x^2 + 2x - 4$

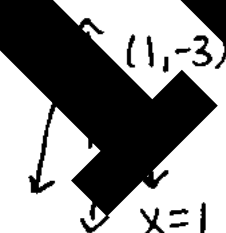
$$x = \frac{-(2)}{2(-1)} = \frac{-2}{-2} = 1$$

$$y = -(1)^2 + 2(1) - 4 \\ = -1 + 2 - 4 = -3$$

Axis of Symmetry: $x = 1$

Vertex: $(1, -3)$

Sketch:



13. $y = -3x^2$

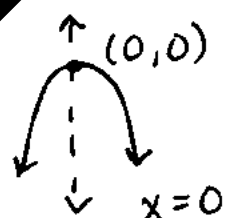
$$x = \frac{-(0)}{2(-3)} = 0$$

$$y = -3(0)^2 \\ = 0$$

Axis of Symmetry: $x = 0$

Vertex: $(0, 0)$

Sketch:



14. $y = 2x^2 - 12x + 10$

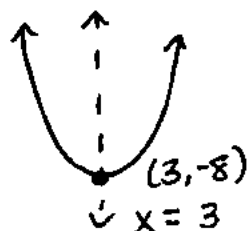
$$x = \frac{-(-12)}{2(2)} = \frac{12}{4} = 3$$

$$y = 2(3)^2 - 12(3) + 10 \\ = 18 - 36 + 10 = -8$$

Axis of Symmetry: $x = 3$

Vertex: $(3, -8)$

Sketch:



15. $y = x^2 + 10x + 24$

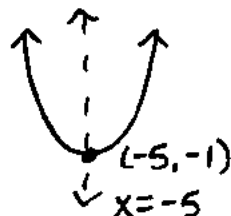
$$x = \frac{-10}{2(1)} = \frac{-10}{2} = -5$$

$$y = (-5)^2 + 10(-5) + 24 \\ = 25 - 50 + 24 = -1$$

Axis of Symmetry: $x = -5$

Vertex: $(-5, -1)$

Sketch:



Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

Steps to Graph a
QUADRATIC
EQUATION

- 1 Find the **axis of symmetry**.
- 2 Find the **vertex**.
- 3 Put the vertex in the middle row of the table. Fill in a row of x values using your calculator.
- 4 Plot the points and connect them into a smooth parabola.

EXAMPLES

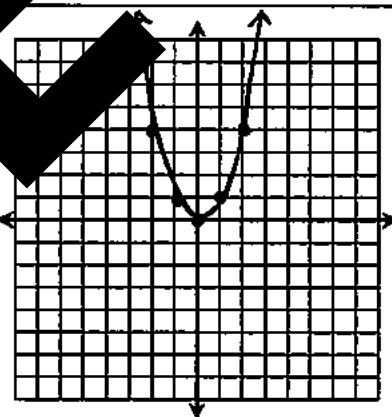
Directions: Graph each quadratic equation using a table. Identify the axis of symmetry, vertex, domain, and range.

1. $y = x^2$

$$x = \frac{-0}{2(1)} = 0$$

Axis of Symmetry: $x = 0$ Vertex: $(0, 0)$ Domain: $\mathbb{R}$ Range: $y \geq 0$

x	y
-2	4
-1	1
0	0
1	1
2	4

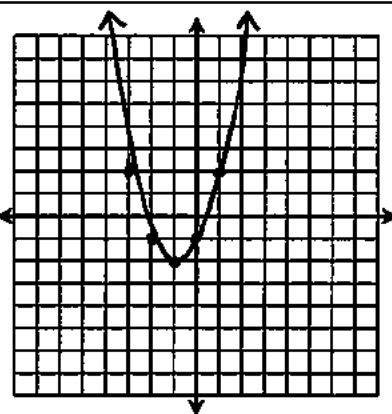


2. $y = x^2 + 2x - 1$

$$x = \frac{-2}{2(1)} = -1$$

Axis of Symmetry: $x = -1$ Vertex: $(-1, -2)$ Domain: $\mathbb{R}$ Range: $y \geq -2$

x	y
-3	2
-2	-1
-1	-2
0	-1
1	2

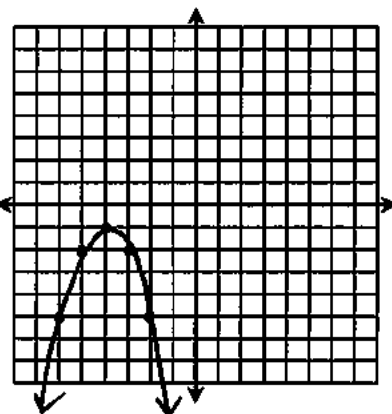


3. $y = -x^2 - 8x - 17$

$$x = \frac{-(-8)}{2(-1)} = \frac{8}{-2} = -4$$

Axis of Symmetry: $x = -4$ Vertex: $(-4, -1)$ Domain: $\mathbb{R}$ Range: $y \leq -1$

x	y
-6	-5
-5	-2
-4	-1
-3	-2
-2	-5



4. $y = -2x^2 + 4x + 1$

$$X = \frac{-4}{2(-2)} = \frac{-4}{-4} = 1$$

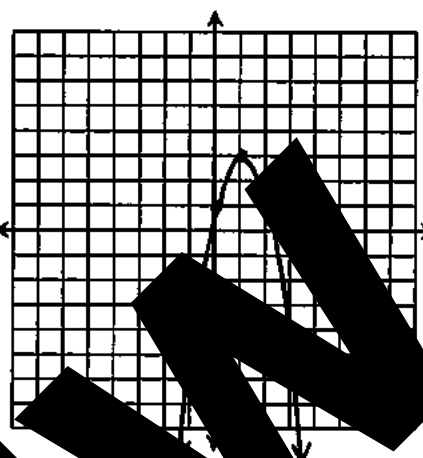
Axis of Symmetry: $X = 1$

Vertex: $(1, 3)$

Domain: $\mathbb{R}$

Range: $y \leq 3$

x	y
-1	-5
0	1
1	3
2	1
3	-5



5. $y = x^2 - 6x + 11$

$$X = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$$

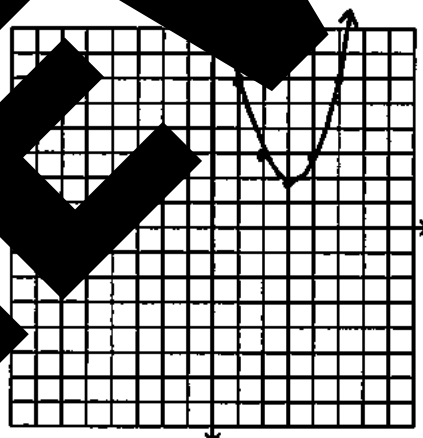
Axis of Symmetry: $X = 3$

Vertex: $(3, 2)$

Domain: $\mathbb{R}$

Range: $y \geq 2$

x	y
1	6
2	3
3	2
4	3
5	6



6. $y = -x^2 - 2$

$$X = \frac{-0}{2(-1)} = 0$$

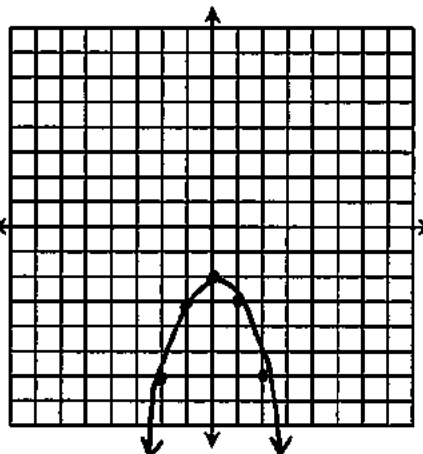
Axis of Symmetry: $X = 0$

Vertex: $(0, -2)$

Domain: $\mathbb{R}$

Range: $y \leq -2$

x	y
-2	-6
-1	-3
0	-2
1	-3
2	-6



7. $y = 2x^2 + 8x$

$$X = \frac{-8}{2(2)} = \frac{-8}{4} = -2$$

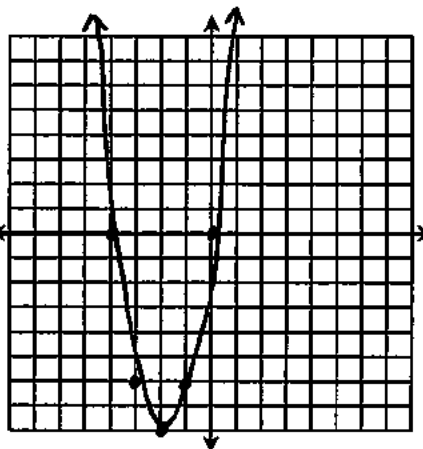
Axis of Symmetry: $X = -2$

Vertex: $(-2, -8)$

Domain: $\mathbb{R}$

Range: $y \geq -8$

x	y
-4	0
-3	-6
-2	-8
-1	-6
0	0



8. $y = -x^2 + 4x + 3$

$$x = \frac{-4}{2(-1)} = \frac{-4}{-2} = 2$$

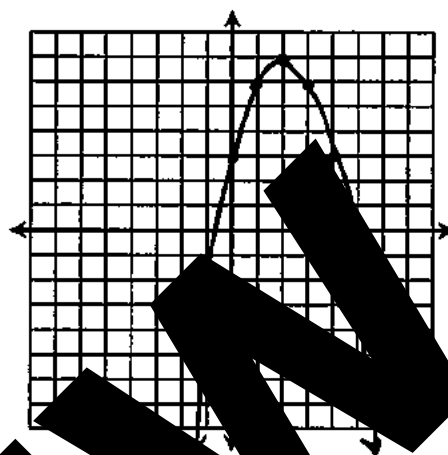
Axis of Symmetry: $x = 2$

Vertex: $(2, 7)$

Domain: $\mathbb{R}$

Range: $y \leq 7$

x	y
0	3
1	6
2	7
3	6
4	3



9. $y = -x^2 - 2x$

$$x = \frac{-(-2)}{2(-1)} = \frac{2}{-2} = -1$$

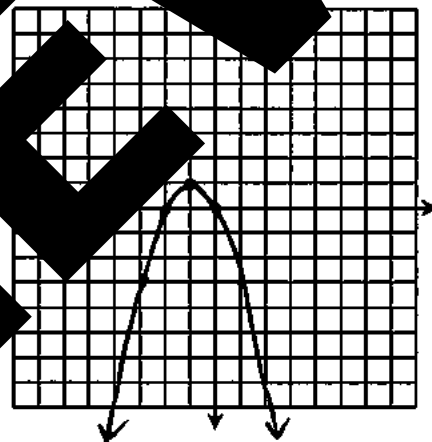
Axis of Symmetry: $x = -1$

Vertex: $(-1, 1)$

Domain: $\mathbb{R}$

Range: $y \leq 1$

x	y
-2	-4
-1	1
0	0
1	-1



10. $y = x^2 - 18x + 81$

$$x = \frac{-(-18)}{2(1)} = \frac{18}{2} = 9$$

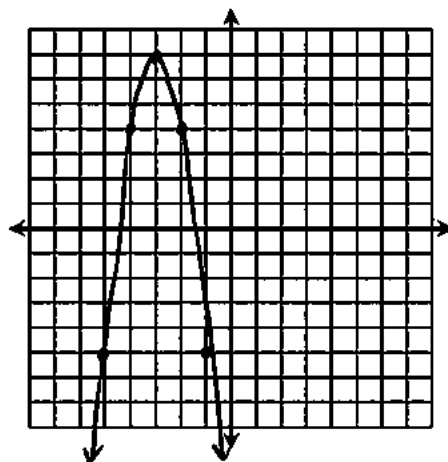
Axis of Symmetry: $x = 9$

Vertex: $(9, -81)$

Domain: $\mathbb{R}$

Range: $y \geq -81$

x	y
-5	-5
-4	4
-3	7
-2	4
-1	-5



11. $y = \frac{1}{2}x^2 - 6x + 11$

$$x = \frac{-(-6)}{2(1/2)} = \frac{6}{1} = 6$$

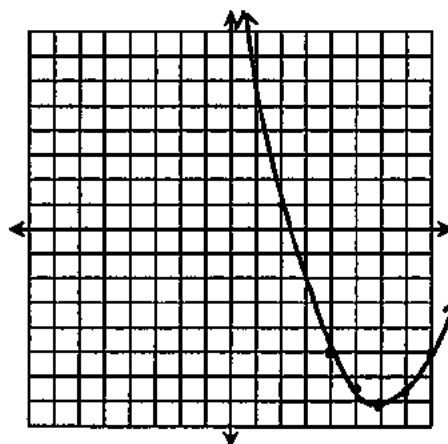
Axis of Symmetry: $x = 6$

Vertex: $(6, -7)$

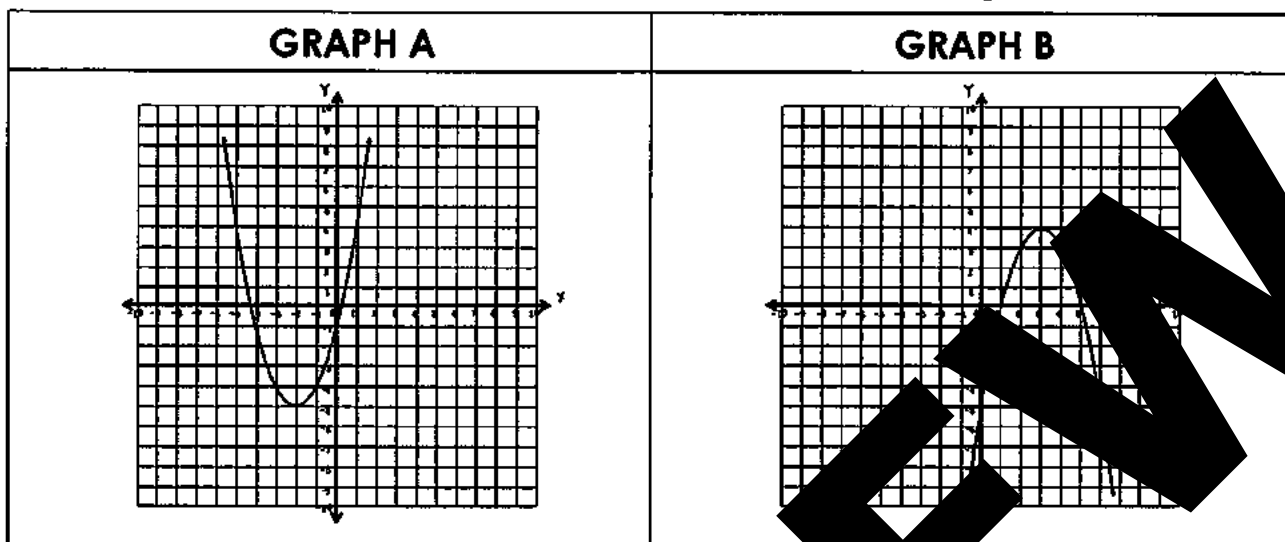
Domain: $\mathbb{R}$

Range: $y \geq -7$

x	y
4	-5
5	-6.5
6	-7
7	-6.5
8	-5



Analyzing Quadratic Graphs



Answer the questions given the graphs above.

1. What is the axis of symmetry for Graph A? _____

2. What is the axis of symmetry for Graph B? _____

3. What is the vertex of Graph A? $(-2, -5)$ Maximum or Minimum? Minimum

4. What is the vertex of Graph B? $(3, 4)$ Maximum or Minimum? Maximum

5. Identify the domain and range of Graph A.

D: $\mathbb{R}$; R: $y \geq -5$

6. Identify the domain and range of Graph B.

D: $\mathbb{R}$; R: $y \leq 4$

7. Identify the equation for Graph A:

A. $y = x^2 - 4x - 1$

C. $y = -x^2 - 4x - 1$

☒ B. $y = x^2 + 4x - 1$

D. $y = -x^2 + 4x - 1$

8. Identify the equation for Graph B:

A. $y = x^2 - 6x - 5$

C. $y = -x^2 - 6x - 5$

B. $y = x^2 + 6x - 5$

☒ D. $y = -x^2 + 6x - 5$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 2: Graphing Quadratic Equations

**** This is a 2-page document! ******Graph each quadratic equation using a table of values. Identify all key characteristics.**

1. $y = x^2 + 10x + 26$

$$x = \frac{-10}{2(1)} = -5$$

Axis of Symmetry: $x = -5$ Vertex: $(-5, 1)$ Domain: $\mathbb{R}$ Range: $y \geq 1$

x	y
-7	5
-6	2
-5	1
-4	2
-3	5

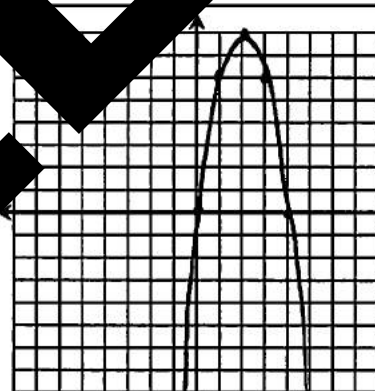


2. $y = -2x^2 + 8x$

$$x = \frac{-8}{2(-2)} = 2$$

Axis of Symmetry: $x = 2$ Vertex: $(2, 8)$ Domain: $\mathbb{R}$ Range: $y \leq 8$

x	y
0	0
1	6
2	8
3	6
4	0

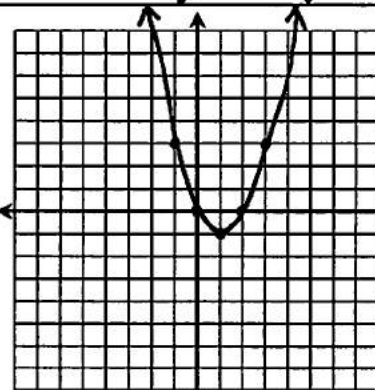


3. $y = x^2 - 2x$

$$x = \frac{-(-2)}{2(1)} = 1$$

Axis of Symmetry: $x = 1$ Vertex: $(1, -1)$ Domain: $\mathbb{R}$ Range: $y \geq -1$

x	y
-1	3
0	0
1	-1
2	0
3	3

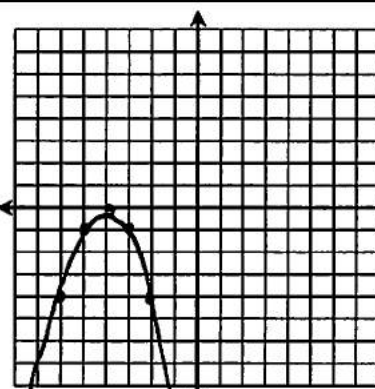


4. $y = -x^2 + 8x - 16$

$$x = \frac{-(-8)}{2(-1)} = -4$$

Axis of Symmetry: $x = -4$ Vertex: $(-4, 0)$ Domain: $\mathbb{R}$ Range: $y \leq 0$

x	y
-6	-4
-5	-1
-4	0
-3	-1
-2	-4



5. $y = 3x^2 - 5$

$$x = \frac{-0}{2(3)} = 0$$

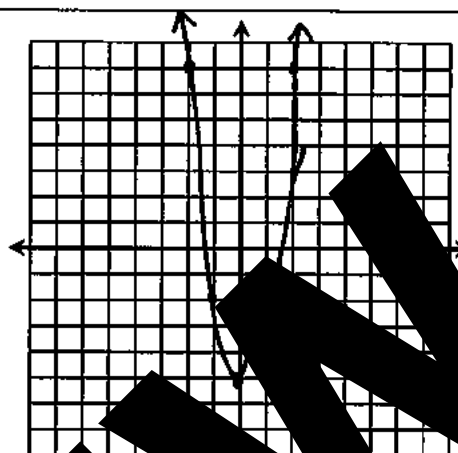
Axis of Symmetry: $x = 0$

Vertex: $(0, -5)$

Domain: $\mathbb{R}$

Range: $y \geq -5$

x	y
-2	7
-1	-2
0	-5
1	-2
2	7



6. $y = -2x^2 + 12x - 15$

$$x = \frac{-12}{2(-2)} = 3$$

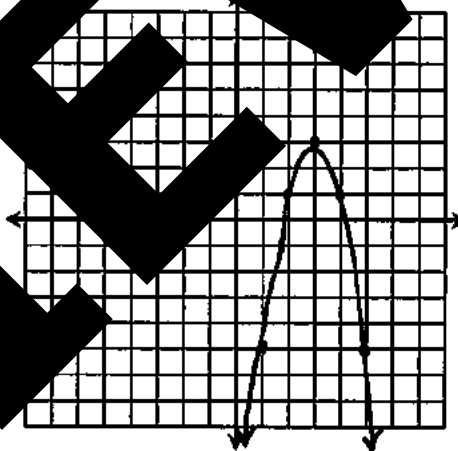
Axis of Symmetry: $x = 3$

Vertex: $(3, 3)$

Domain: $\mathbb{R}$

Range: $y \leq 3$

x	y
1	-5
2	-3
3	3
4	1
5	-5



7. $y = -x^2 + 1$

$$x = \frac{-0}{2(-1)} = 0$$

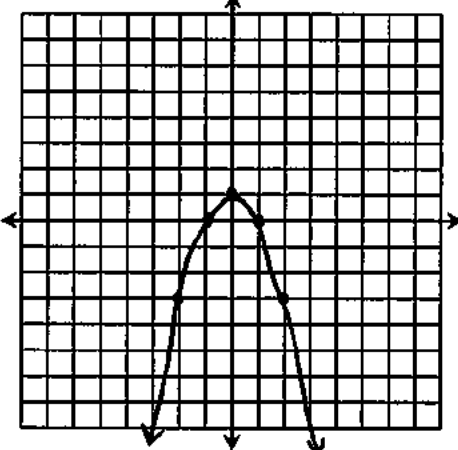
Axis of Symmetry: $x = 0$

Vertex: $(0, 1)$

Domain: $\mathbb{R}$

Range: $y \leq 1$

x	y
-2	-3
-1	0
0	1
1	0
2	-3



8. $y = 2x^2 - 16x + 30$

$$x = \frac{-(-16)}{2(2)} = 4$$

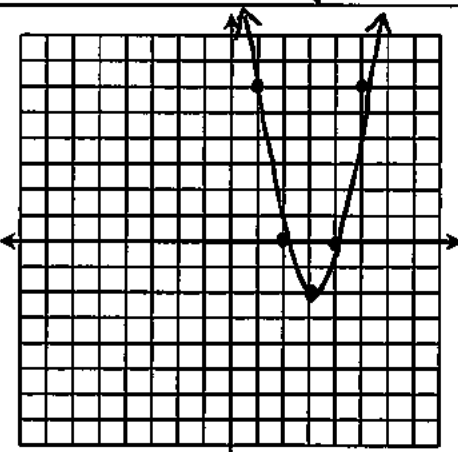
Axis of Symmetry: $x = 4$

Vertex: $(4, -2)$

Domain: $\mathbb{R}$

Range: $y \geq -2$

x	y
2	6
3	0
4	-2
5	0
6	6



Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

VERTEX FORM

of a Quadratic Equation

- Vertex Form of a Quadratic Equation:

$$y = a(x - h)^2 + k$$

- (h, k) is the vertex; $x = h$ is the axis of symmetry

Directions: Give the axis of symmetry and vertex of each quadratic equation.

1. $y = (x + 4)^2 - 2$

Axis of Symmetry: $x = -4$ Vertex: $(-4, -2)$

2. $y = (x - 3)^2$

Axis of Symmetry: $x = 3$ Vertex: $(3, 0)$

3. $y = (x - 5)^2 - 4$

Axis of Symmetry: $x = 5$ Vertex: $(5, -4)$

4. $y = x^2 + 3$

Axis of Symmetry: $x = 0$ Vertex: $(0, 3)$

GRAPHING

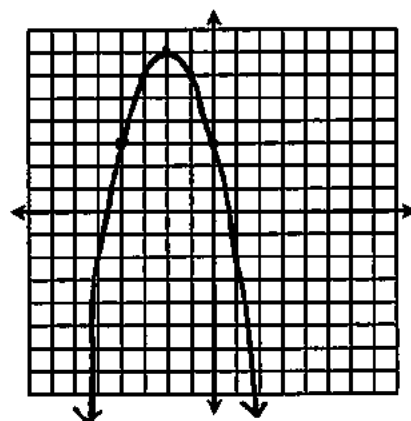
from Vertex Form

Directions: Graph each equation using a table of values. Identify the axis of symmetry, vertex, domain, and range.

5. $y = (x + 2)^2 + 7$

Axis of Symmetry: $x = -2$ Vertex: $(-2, 7)$ Domain: $\mathbb{R}$ Range: $y \geq 7$

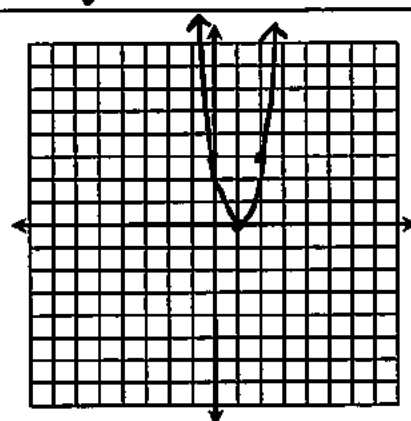
x	y
-4	3
-3	6
-2	7
-1	6
0	3



6. $y = 3(x - 1)^2$

Axis of Symmetry: $x = 1$ Vertex: $(1, 0)$ Domain: $\mathbb{R}$ Range: $y \geq 0$

x	y
-1	12
0	3
1	0
2	3
3	12



TRANSFORMATIONS

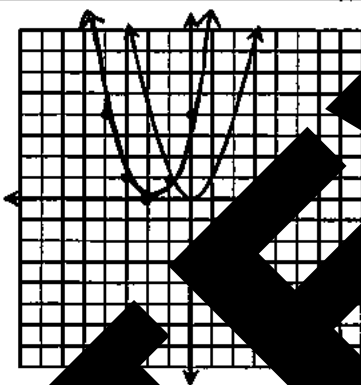
from the
Parent Function

- The most simplistic quadratic equation is $y = x^2$.
- This is known as the parent function.
- A **transformation** is a change to the size or position of a figure.

Directions: Graph each function. Describe how it compares to the parent function shown on the graph.

7. $y = (x + 2)^2$

x	y
-4	4
-3	1
-2	0
-1	1
0	4



8. $y = x^2 + 5$

x	y
-2	9
-1	6
0	5
1	6
2	9

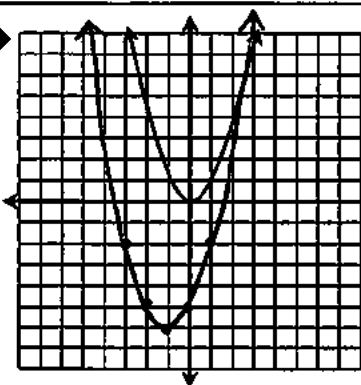


Transformations:

up 5

9. $y = (x - 1)^2 - 6$

x	y
-3	-2
-2	-5
-1	-6
0	-5
1	-2

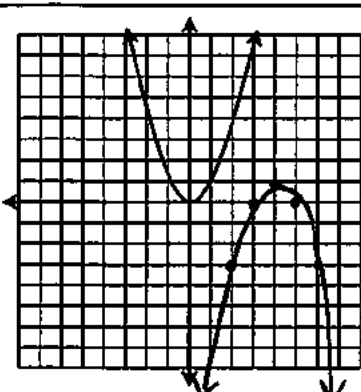


Transformations:

Left 1,
Down 6

10. $y = -(x - 4)^2 + 1$

x	y
2	-3
3	0
4	1
5	0
6	-3

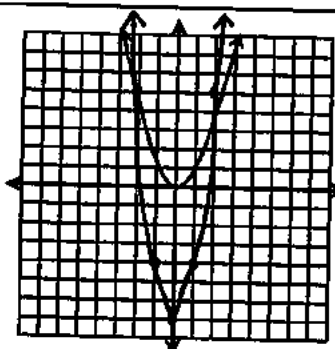


Transformations:

Flipped,
Right 4,
up 1

11. $y = 3x^2 - 7$

x	y
-2	5
-1	-4
0	-7
1	-4
2	5

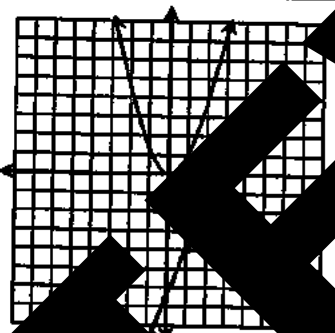


Transformations:

Stretched /
Narrow
Down 7

12. $y = -\frac{1}{2}(x-3)^2 - 2$

x	y
1	-4
2	-2.5
3	-2
4	-2.5
5	-4



Transformations:

Flipped,
Right 3,
Down 2

PUT IT
TOGETHER!

Given a quadratic equation in vertex form, $f(x) = a(x-h)^2 + k$:

- h is the horizontal shift. left - shifts right
- k is the vertical shift. up - shifts down
- If a is negative, the parabola is reflected across the x-axis
- $|a| > 1$ represents a vertical stretch
- $|a| < 1$ represents a vertical compression

WRITING
EQUATIONS

Describe the transformations from the parent function $y = x^2$ are described below. Write an equation to represent the function.

13. translated 2 units right

$$y = (x-2)^2$$

14. translated 5 units up

$$y = x^2 + 5$$

15. translated 3 units left and 4 units down

$$y = (x+3)^2 - 4$$

16. translated 7 units right and 4 units up

$$y = (x-7)^2 + 4$$

17. reflected over the x-axis, then translated 3 units down

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

18. reflected over the x-axis, then translated 5 units right and 2 units down

$$y = -(x-5)^2 - 2$$

19. vertically compressed by a factor of $\frac{1}{3}$, then translated 8 units up

$$y = \frac{1}{3}x^2 + 8$$

20. vertically stretched by a factor of 2, reflected over the x-axis, then translated 4 units left

$$y = -2(x+4)^2$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

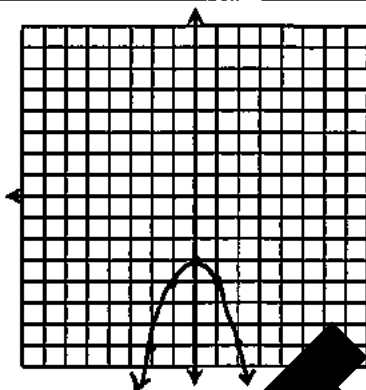
Homework 3: Vertex Form of a Quadratic Equation

**** This is a 2-page document! ****

Graph each equation and give the axis of symmetry, vertex, domain, and range. Then, identify the transformations of the equation from the parent function.

1. $y = -x^2 - 3$

x	y
-2	-7
-1	-4
0	-3
1	-4
2	-7



Axis of Symmetry:

Vertex: $(0, -3)$

Domain:

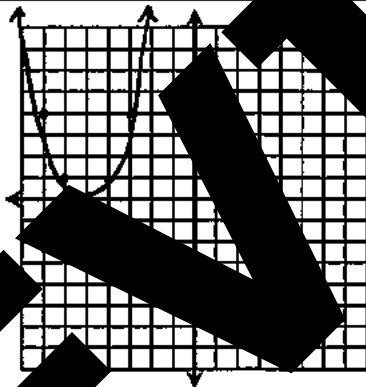
Range: $y \leq -3$

Transformations:

Reflected across x-axis,
Down 3

2. $y = (x + 5)^2$

x	y
-7	4
-6	1
-5	0
-4	1
-3	4

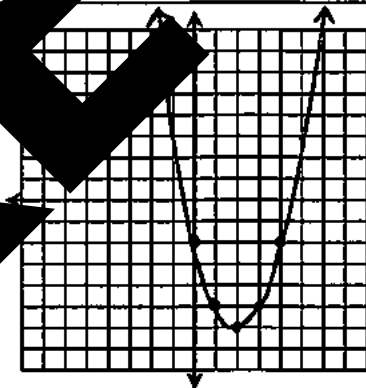
Axis of Symmetry: $x = -5$ Vertex: $(-5, 0)$ Domain: $\mathbb{R}$ Range: $y \geq 0$

Transformations:

Left 5

3. $y = (x - 2)^2 - 6$

x	y
0	-2
1	-5
2	-6
3	-5
4	-2

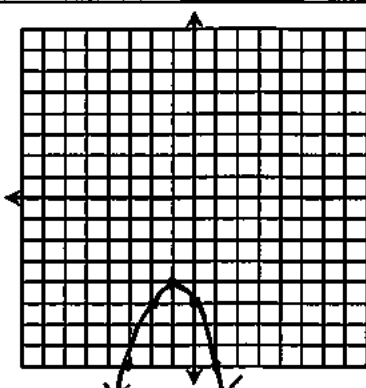
Axis of Symmetry: $x = 2$ Vertex: $(2, -6)$ Domain: $\mathbb{R}$ Range: $y \geq -6$

Transformations:

Right 2,
Down 6

4. $y = -(x + 1)^2 - 4$

x	y
-3	-8
-2	-5
-1	-4
0	-5
1	-8

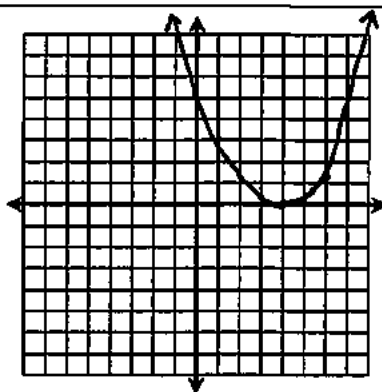
Axis of Symmetry: $x = -1$ Vertex: $(-1, -4)$ Domain: $\mathbb{R}$ Range: $y \leq -4$

Transformations:

Reflected across x-axis,
Left 1, Down 4

5. $y = \frac{1}{3}(x-4)^2$

x	y
2	$\frac{4}{3}$
3	$\frac{1}{3}$
4	0
5	$\frac{1}{3}$
6	$\frac{4}{3}$



Axis of Symmetry: $x = 4$

Vertex: $(4, 0)$

Domain: $\mathbb{R}$

Range: $y \geq 0$

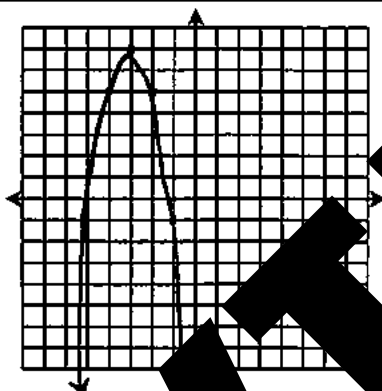
Transformations:

Vertical compression by $\frac{1}{3}$,

Right 4

6. $y = -2(x+3)^2 + 7$

x	y
-5	-1
-4	5
-3	7
-2	5
-1	-1



Axis of Symmetry: $x = -3$

Vertex: $(-3, 7)$

Domain: $\mathbb{R}$

Range: $y \leq 7$

Transformations:

Vertical stretch by 2,

Reflection across x-axis,

Left 3, up 7

Without graphing, describe the transformations from the parent function.

7. $y = (x-2)^2 - 1$

Right 2,
Down 1

8. $y = 4x^2 - 5$

Stretch by 4,
Down 5

9. $y = -\frac{1}{2}(x+1)^2$

Compress by $\frac{1}{2}$,
Reflected,
Left 1

Transformations of the parent function are given below. Write an equation to represent the function.

10. reflected over the x-axis, then translated 6 units left

$y = -(x+6)^2$

11. translated 1 unit right and 5 units down

$y = (x-1)^2 - 5$

12. vertically stretched by a factor of 3, then translated 4 units up

$y = 3x^2 + 4$

13. reflected over the x-axis, then vertically compressed by a factor of $\frac{1}{4}$

$y = -\frac{1}{4}x^2$

14. reflected over the x-axis, then translated 8 units left and 3 units up

$y = -(x+8)^2 + 3$

15. vertically stretched by a factor of $\frac{5}{2}$, reflected over the x-axis, then translated 3 units down

$y = -\frac{5}{2}x^2 - 3$

Name: _____

Algebra I

Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-1: Graphing Quadratic Equations

Identify the following forms of a quadratic equation:

1. Standard Form

2. Vertex Form

1. $y = ax^2 + bx + c$
 2. $y = a(x-h)^2 + k$

Using the axis of symmetry formula, find the axis of symmetry and vertex for each equation.

3. $y = -x^2 + 10x - 26$

$$x = \frac{-10}{2(-1)} = \frac{-10}{-2} = 5$$

Axis of Symmetry: $x = 5$

Vertex: $(5, -1)$

$$y = -(5)^2 + 10(5) - 26 = -1$$

4. $y = 3x^2 - 6x$

$$x = \frac{-(-6)}{2(3)} = \frac{6}{6} = 1$$

Axis of Symmetry: $x = 1$

Vertex: $(1, -3)$

$$y = 3(1)^2 - 6(1) = -3$$

5. $y = 2x^2 - 4$

$$x = \frac{-0}{2(2)} = 0$$

Axis of Symmetry: $x = 0$

Vertex: $(0, -4)$

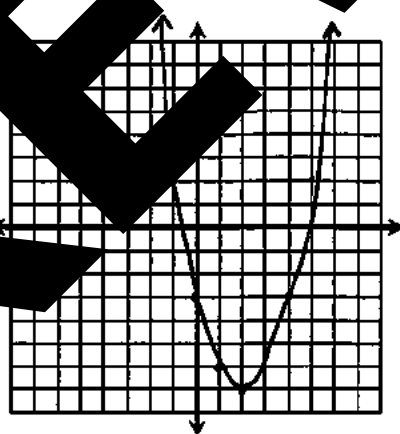
$$y = 2(0)^2 - 4 = -4$$

Graph each equation using a table of values, and identify each characteristic.

6. $y = x^2 - 4x - 3$

$$x = \frac{-(-4)}{2(1)} = 2$$

x	y
-1	-8
0	-3
1	-4
2	-7
3	-6
4	-3
5	2



Axis of Symmetry: $x = 2$

Vertex: $(2, -7)$

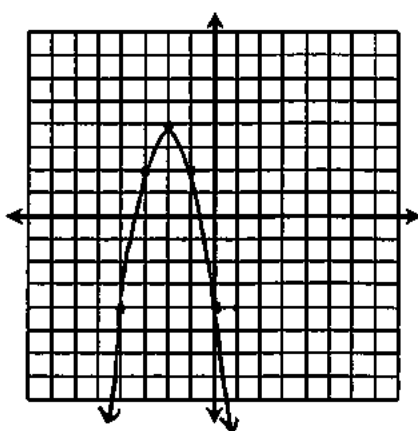
Domain: $\mathbb{R}$

Range: $y \geq -7$

7. $y = -x^2 - 8x - 4$

$$x = \frac{-(-8)}{2(-1)} = \frac{8}{-2} = -4$$

x	y
-4	-4
-3	2
-2	4
-1	2
0	-4



Axis of Symmetry: $x = -4$

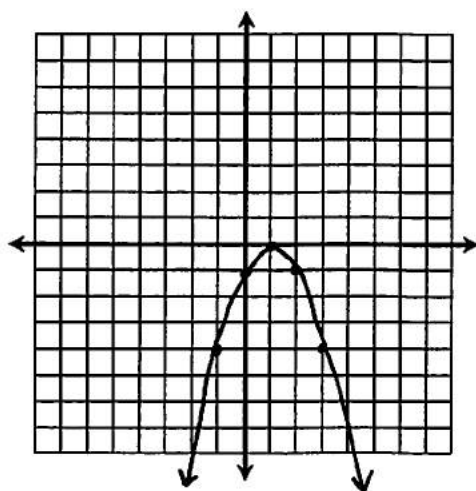
Vertex: $(-4, 4)$

Domain: $\mathbb{R}$

Range: $y \leq 4$

8. $y = -(x-1)^2$

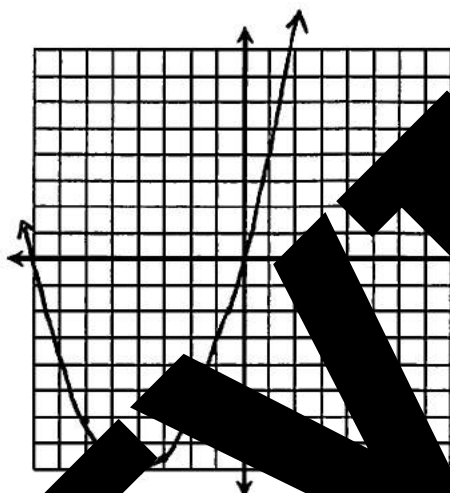
x	y
-1	-4
0	-1
1	0
2	-1
3	-4



Axis of Symmetry:	$X=1$
Vertex:	$(1,0)$
Domain:	$\mathbb{R}$
Range:	$y \leq 0$
Transformations:	Reflected across x-axis, Right

9. $y = \frac{1}{2}(x+4)^2 - 8$

x	y
-6	-6
-5	-7.5
-4	-8
-3	-7.5
-2	-6



Axis of Symmetry:	$X=-4$
Vertex:	$(-4,-8)$
Domain:	
Range:	$y \geq -8$
Transformations:	Vertical compression by 1/2, Left + 4, Down 8

Without graphing, describe the transformations of each equation from its parent function.

10. $y = -x^2 + 4$

Transformations:
Reflected across x-axis,
Up

11. $y = 3(x-6)^2 - 2$

Transformations:
Vertical stretch by 3,
Right 6, Down 2

The transformations of the parent function of a quadratic equation are given below. Write an equation of the new function in vertex form.

Translated 3 units down

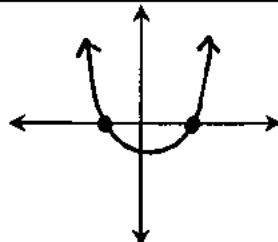
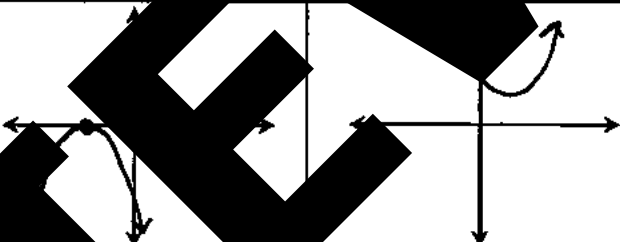
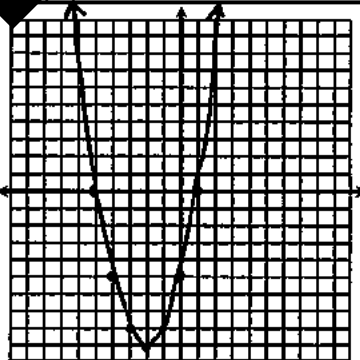
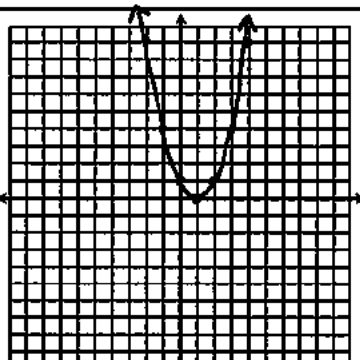
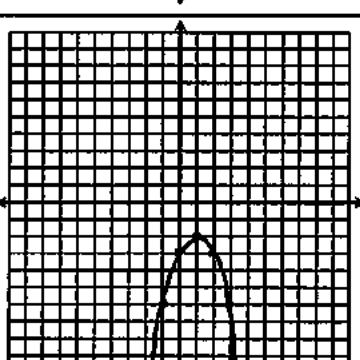
13. translated 7 units right and 2 units up

14. reflected over the x-axis, then translated 5 units left

15. vertically stretched by a factor of 2, then translated 4 units left and 1 unit down

12. $y = x^2 - 3$
 13. $y = (x-7)^2 + 2$
 14. $y = -(x+5)^2$
 15. $y = 2(x+4)^2 - 1$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples																
QUADRATIC ROOTS	The points at which the parabola intersects the x-axis																
also called...	zeros, solutions, intercepts																
NUMBER OF SOLUTIONS	2 SOLUTIONS	1 SOLUTION															
																	
EXAMPLES Find the solutions of the following quadratic equations by graphing. Solutions: 1. $x = \{-5, 1\}$ 2. $x = \{1\}$ 3. $x = \{0\}$	1. $y = x^2 + 4x - 5$ $x = \frac{-4}{2(1)} = -2$	<table><tr><td>-5</td><td>-8</td></tr><tr><td>-4</td><td>-9</td></tr><tr><td>-3</td><td>-8</td></tr><tr><td>-2</td><td>-5</td></tr><tr><td>-1</td><td>0</td></tr><tr><td>0</td><td>5</td></tr><tr><td>1</td><td>8</td></tr></table> 	-5	-8	-4	-9	-3	-8	-2	-5	-1	0	0	5	1	8	
	-5	-8															
	-4	-9															
	-3	-8															
-2	-5																
-1	0																
0	5																
1	8																
2. $y = x^2 - 2x$ $x = \frac{2}{2(1)} = 1$	<table><tr><td>x</td><td>y</td></tr><tr><td>-2</td><td>9</td></tr><tr><td>-1</td><td>4</td></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr><tr><td>2</td><td>1</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>9</td></tr></table> 	x	y	-2	9	-1	4	0	1	1	0	2	1	3	4	4	9
x	y																
-2	9																
-1	4																
0	1																
1	0																
2	1																
3	4																
4	9																
3. $y = -x^2 + 2x - 3$ $x = \frac{-2}{2(-1)} = 1$	<table><tr><td>x</td><td>y</td></tr><tr><td>-2</td><td>-11</td></tr><tr><td>-1</td><td>-6</td></tr><tr><td>0</td><td>-3</td></tr><tr><td>1</td><td>-2</td></tr><tr><td>2</td><td>-3</td></tr><tr><td>3</td><td>-6</td></tr><tr><td>4</td><td>-11</td></tr></table> 	x	y	-2	-11	-1	-6	0	-3	1	-2	2	-3	3	-6	4	-11
x	y																
-2	-11																
-1	-6																
0	-3																
1	-2																
2	-3																
3	-6																
4	-11																

Solutions:

4. $x = \{2, 8\}$

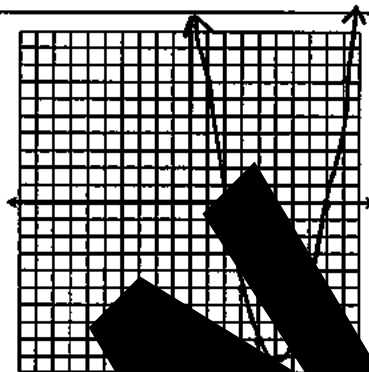
5. $x = \{-3, 3\}$

6. $x = \{0, 2\}$

4. $y = x^2 - 10x + 16$

$$x = \frac{-(-10)}{2(1)} = 5$$

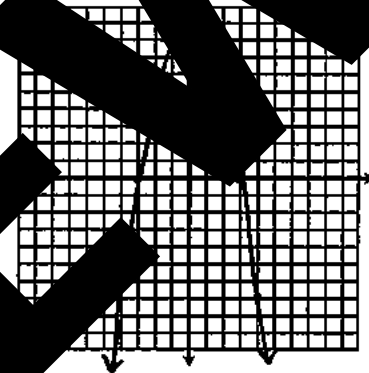
x	y
2	0
3	-5
4	-8
5	-9
6	-8
7	-5
8	0



5. $y = -x^2 + 9$

$$x = \frac{-(-0)}{2(-1)} = 0$$

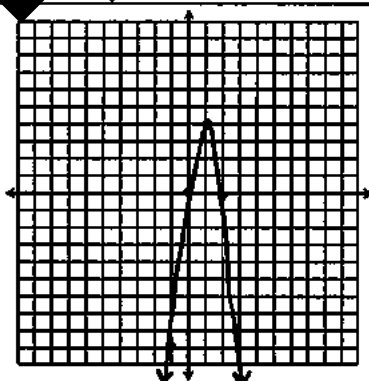
x	y
-3	0
-2	5
-1	8
0	9
1	8
2	5
3	0



6. $y = -3x^2 + 6x$

$$x = \frac{-6}{2(-3)} = 1$$

x	y
-2	-12
-1	-3
0	0
1	3
2	0
3	-9
4	-24



Use the discriminant to determine the number of solutions

Formula: $b^2 - 4ac$

- > If $d > 0$, then there are 2 solutions.
- > If $d = 0$, then there are 1 solution.
- > If $d < 0$, then there are 0 solutions.

EXAMPLES

Use the discriminant to determine the number of solutions.

7. $y = x^2 + 5x + 4$

$$5^2 - 4(1)(4)$$

$$25 - 16 = 9$$

- ☒ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

8. $y = x^2 - 3x + 10$

$$(-3)^2 - 4(1)(10)$$

$$9 - 40 = -31$$

- ☐ 2 solutions
- ☐ 1 solution
- ☒ 0 solutions

9. $y = x^2 + 10x + 25$

$$10^2 - 4(1)(25)$$

$$100 - 100 = 0$$

- ☐ 2 solutions
- ☒ 1 solution
- ☐ 0 solutions

10. $y = 2x^2 - 4x - 3$

$$(-4)^2 - 4(2)(-3)$$

$$16 + 24 = 40$$

- ☒ 2 solutions
- ☐ 1 solution
- ☐ 0 solutions

11. $y = 4x^2 - 12x + 9$

$$(-12)^2 - 4(4)(9)$$

$$144 - 144 = 0$$

- ☐ 2 solutions
- ☒ 1 solution
- ☐ 0 solutions

12. $y = -3x^2 + 5x - 8$

$$5^2 - 4(-3)(-8)$$

$$25 - 96 = -71$$

- ☐ 2 solutions
- ☐ 1 solution
- ☒ 0 solutions

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 4: Quadratic Roots

**** This is a 2-page document! ****

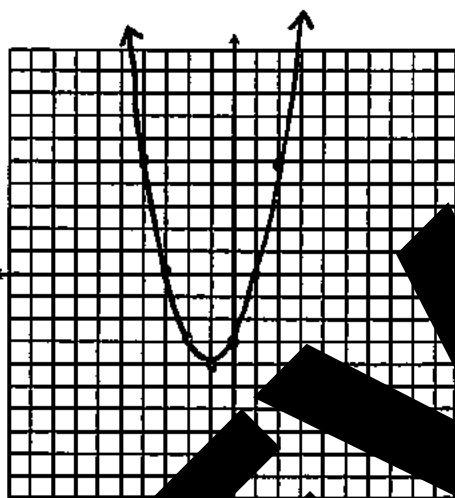
1. The points at which a quadratic equation intersects the x-axis are referred to as:

- zeros
- roots
- x-intercepts
- solutions

Graph each quadratic equation and identify its solutions.

2. $y = x^2 + 2x - 3$ $x = \frac{-2}{2(1)} = -1$

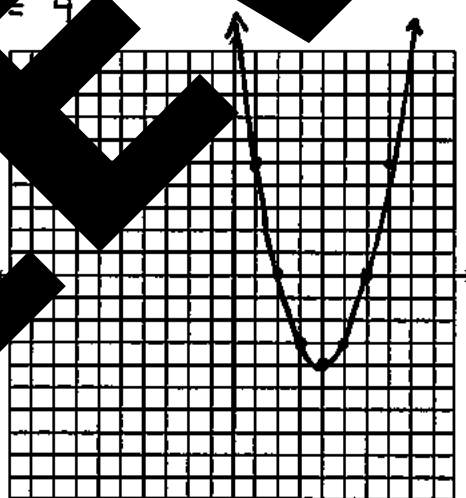
x	y
-4	5
-3	0
-2	-3
-1	-4
0	-3
1	0
2	5



Solutions: $x = \{-3, 1\}$

3. $y = x^2 - 8x + 12$ $x = \frac{8}{2(1)} = 4$

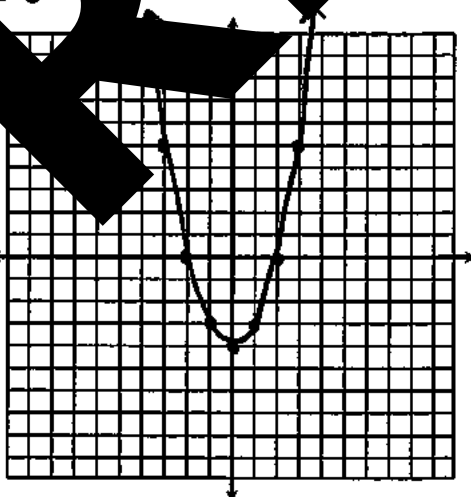
x	y
1	5
2	0
3	-5
4	-4
5	-3
6	0
7	5



Solutions: $x = \{2, 6\}$

4. $y = x^2 - 4$ $x = \frac{0}{2(1)} = 0$

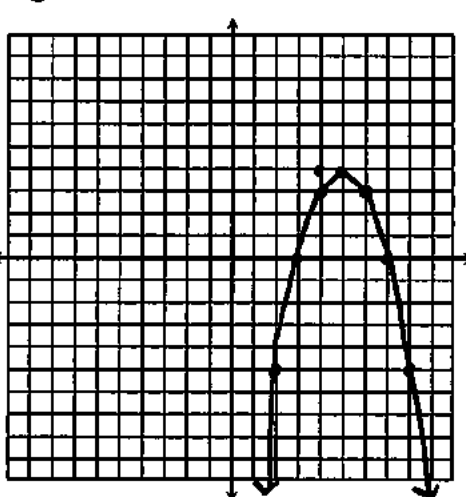
x	y
-3	5
-2	0
-1	-3
0	-4
1	-3
2	0
3	5



Solutions: $x = \{-2, 2\}$

5. $y = -x^2 + 10x - 21$ $x = \frac{10}{2(-1)} = -5$

x	y
2	-5
3	0
4	3
5	4
6	3
7	0
8	-5

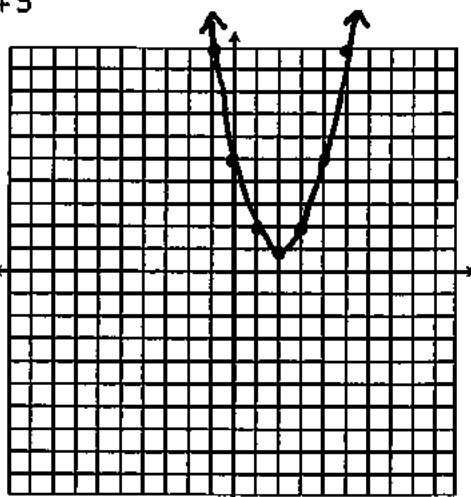


Solutions: $x = \{3, 7\}$

6. $y = x^2 - 4x + 5$

$x = \frac{-(-4)}{2(1)} = 2$

x	y
-1	10
0	5
1	2
2	1
3	2
4	5
5	10



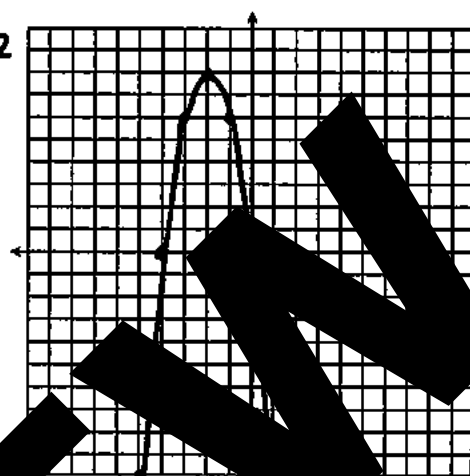
Solutions:

$x = \{ \}; \emptyset$

7. $y = -2x^2 - 8x$

$x = \frac{-(-8)}{2(-2)} = -2$

x	y
-5	-10
-4	0
-3	6
-2	8
-1	6
0	0
1	-10



Solutions:

$x = \{-4, 0\}$

8. $y = x^2 - 6x + 9$

$x = \frac{-(-6)}{2(1)} = 3$

x	y
0	9
1	4
2	1
3	0
4	1
5	4
6	9

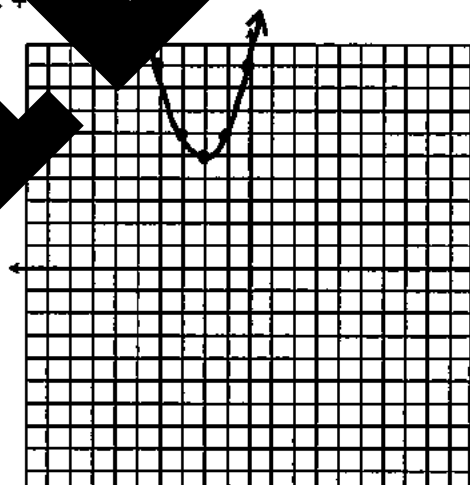


Solutions:

$x = \{3\}$

9. $y = x^2 + 4x + 4$

x	y
-5	14
-4	9
-3	6
-2	5
-1	6
0	9
1	14



Solutions:

$x = \{ \}; \emptyset$

Use the discriminant to determine the number of solutions.

10. $y = 3x^2 - 12x + 12$
 $(-3)^2 - 4(1)(2) = 9 - 8 = 1$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

11. $y = 2x^2 - 4x + 3$
 $(-4)^2 - 4(2)(3) = 16 - 24 = -8$

- ☐ 2 solutions
☐ 1 solution
☒ 0 solutions

12. $y = 3x^2 + 5x - 1$
 $5^2 - 4(3)(-1) = 25 + 12 = 37$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

13. $y = x^2 - 5x - 10$
 $(-5)^2 - 4(1)(-10) = 25 + 40 = 65$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

14. $y = -x^2 + 2x - 1$
 $2^2 - 4(-1)(-1) = 4 - 4 = 0$

- ☐ 2 solutions
☒ 1 solution
☐ 0 solutions

15. $y = 4x^2 - 9$
 $0^2 - 4(4)(-9) = 0 + 144 = 144$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

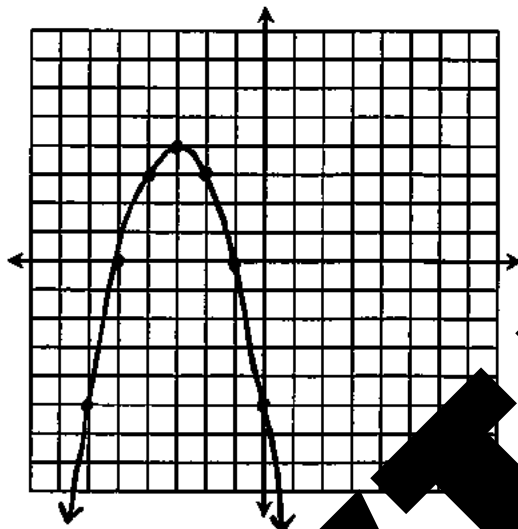
entrance ticket

Name: _____

Graph the quadratic equation using a table of values. Then, identify each characteristic.

1) $y = -x^2 - 6x - 5$

x	y
-6	-5
-5	0
-4	3
-3	4
-2	3
-1	0
0	-5



$$x = \frac{-(-6)}{2(-1)} = \frac{6}{-2} = -3$$

$$y = -(-3)^2 - 6(-3) - 5 = -9 + 18 - 5 = 4$$

Axis of Symmetry: $x = -3$

Vertex: $(-3, 4)$

Domain: $\mathbb{R}$

Range: $y \leq 4$

Zeros: $\{-5, -1\}$

TURN OVER!

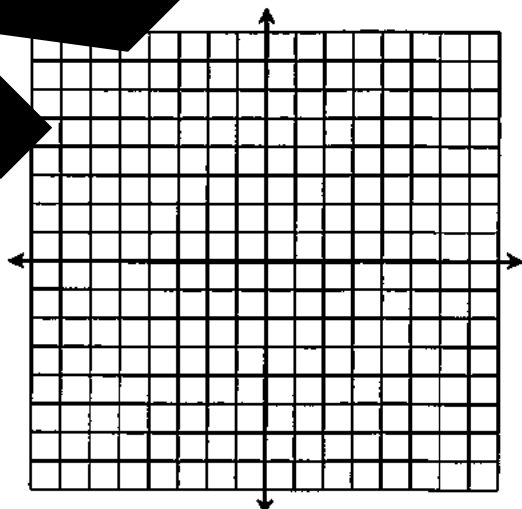
entrance ticket

Name: _____

Graph the quadratic equation using a table of values. Then, identify each characteristic.

1) $y = -x^2 - 6x - 5$

x	y



Axis of Symmetry:

Vertex:

Domain:

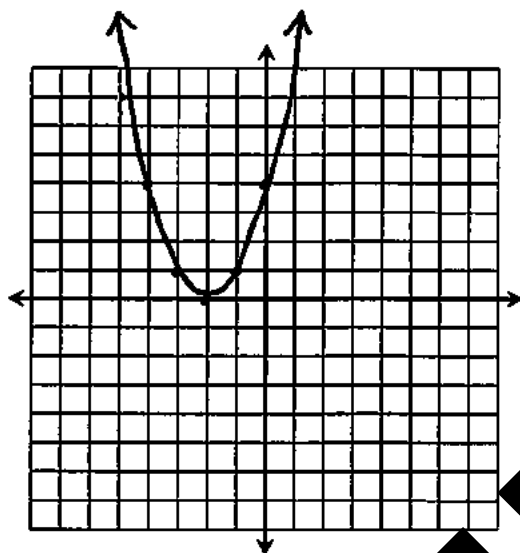
Range:

Zeros:

TURN OVER!

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

x	y
-5	9
-4	4
-3	3
-2	0
-1	3
0	4
1	9



$$x = \frac{-4}{2(1)} = \frac{-4}{2} = -2$$

$$y = (-2)^2 + 4(-2) + 4 = 4 - 8 + 4 = 0$$

Axis of Symmetry: $x = -2$

Vertex: $(-2, 0)$

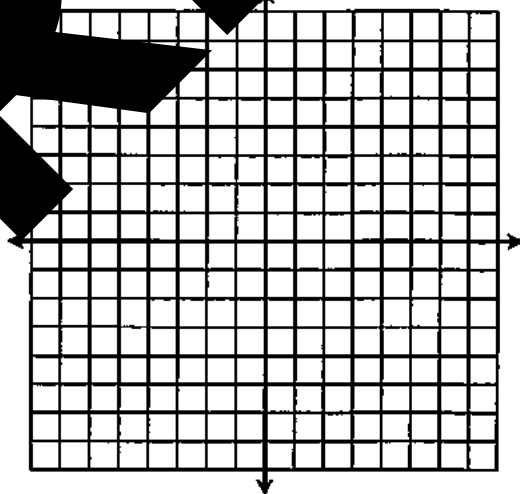
Domain:

Range: $y \geq 0$

Zeros: $x = \{-2\}$

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

x	y
-5	9
-4	4
-3	3
-2	0
-1	3
0	4
1	9



Axis of Symmetry:

Vertex:

Domain:

Range:

Zeros:

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

SOLVING QUADRATICS By Factoring

In many cases, we can find the solutions (or roots, zeros, x-intercepts) of a quadratic equation by factoring, rather than graphing. Follow the steps below to find the solutions of the given equation by factoring.

① Set the quadratic equation equal to 0.

Given: $y = x^2 - 3x - 10$
 $x^2 - 3x - 10 = 0$

② Factor the left side.

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

③ Set each factor equal to 0 and solve each factor for x.

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

④ Write your answer using curly braces.

$x = -5$ $x = 2$

$x = \{-5, 2\}$

YOU TRY!

Directions: Solve the following quadratic equations by factoring.

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

$(x+3)(x+1) = 0$

$x+3=0$ $x+1=0$

$x = -3$ $x = -1$

$x = \{-3, -1\}$

2. $x^2 + 11x + 24 = 0$

$(x+8)(x+3) = 0$

$x+8=0$ $x+3=0$

$x = -8$ $x = -3$

$x = \{-8, -3\}$

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

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

$x+2=0$ $x-1=0$

$x = -2$ $x = 1$

$x = \{-2, 1\}$

4. $x^2 + 6x - 27 = 0$

$(x+9)(x-3) = 0$

$x+9=0$ $x-3=0$

$x = -9$ $x = 3$

$x = \{-9, 3\}$

5. $x^2 - 4x + 21 = 0$

$(x-7)(x-3) = 0$

$x-7=0$ $x-3=0$

$x = 7$ $x = 3$

$x = \{3, 7\}$

6. $x^2 - x - 20 = 0$

$(x-5)(x+4) = 0$

$x-5=0$ $x+4=0$

$x = 5$ $x = -4$

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

7. $x^2 + 10x + 25 = 0$

$(x+5)(x+5) = 0$

$x+5=0$ $x+5=0$

$x = -5$ $x = -5$

$x = \{-5\}$

8. $x^2 - 8x + 16 = 0$

$(x-4)(x-4) = 0$

$x-4=0$ $x-4=0$

$x = 4$ $x = 4$

$x = \{4\}$

$$9. x^2 - 8x = 0$$

$$x(x-8) = 0$$

$$\begin{array}{l|l} x=0 & x-8=0 \\ & x=8 \end{array}$$

$$x = \{0, 8\}$$

$$10. 3x^2 + 15x = 0$$

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

$$\begin{array}{l|l} 3x=0 & x+5=0 \\ x=0 & x=-5 \end{array}$$

$$x = \{0, -5\}$$

$$11. 6x^2 - 12x = 0$$

$$6x(x-2) = 0$$

$$\begin{array}{l|l} 6x=0 & x-2=0 \\ x=0 & x=2 \end{array}$$

$$x = \{0, 2\}$$

$$12. 8x^2 - 6x = 0$$

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

$$\begin{array}{l|l} 2x=0 & 4x-3=0 \\ x=0 & x=3/4 \end{array}$$

$$x = \{0, 3/4\}$$

$$13. x^2 - 64 = 0$$

$$(x+8)(x-8) = 0$$

$$\begin{array}{l|l} x+8=0 & x-8=0 \\ x=-8 & x=8 \end{array}$$

$$x = \{-8, 8\}$$

$$14. x^2 - 25 = 0$$

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

$$\begin{array}{l|l} x+5=0 & x-5=0 \\ x=-5 & x=5 \end{array}$$

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

$$15. 4x^2 - 81 = 0$$

$$(2x-9)(2x+9) = 0$$

$$\begin{array}{l|l} 2x-9=0 & 2x+9=0 \\ x=9/2 & x=-9/2 \end{array}$$

$$x = \{9/2, -9/2\}$$

$$16. x^2 - 49 = 0$$

$$(3x-7)(3x+7) = 0$$

$$\begin{array}{l|l} 3x-7=0 & 3x+7=0 \\ x=7/3 & x=-7/3 \end{array}$$

$$x = \{7/3, -7/3\}$$

EQUATIONS

NOT IN

Standard Form

$$17. x^2 + 4x - 21 = 0$$

$$(x+7)(x-3) = 0$$

$$\begin{array}{l|l} x+7=0 & x-3=0 \\ x=-7 & x=3 \end{array}$$

$$x = \{-7, 3\}$$

$$18. x^2 - 45 = 4x$$

$$x^2 - 4x - 45 = 0$$

$$(x-9)(x+5) = 0$$

$$\begin{array}{l|l} x-9=0 & x+5=0 \\ x=9 & x=-5 \end{array}$$

$$x = \{9, -5\}$$

$$19. x^2 - 5x - 64 = 7x$$

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

$$(x-16)(x+4) = 0$$

$$\begin{array}{l|l} x-16=0 & x+4=0 \\ x=16 & x=-4 \end{array}$$

$$x = \{16, -4\}$$

$$20. x^2 - 10x + 49 = 4x + 1$$

$$x^2 - 14x + 48 = 0$$

$$(x-8)(x-6) = 0$$

$$\begin{array}{l|l} x-8=0 & x-6=0 \\ x=8 & x=6 \end{array}$$

$$x = \{8, 6\}$$

$$21. 11x^2 = x^2 + 8x$$

$$10x^2 - 8x = 0$$

$$2x(5x-4) = 0$$

$$\begin{array}{l|l} 2x=0 & 5x-4=0 \\ x=0 & x=4/5 \end{array}$$

$$x = \{0, 4/5\}$$

$$22. 16x^2 = 9$$

$$16x^2 - 9 = 0$$

$$(4x+3)(4x-3) = 0$$

$$\begin{array}{l|l} 4x+3=0 & 4x-3=0 \\ x=-3/4 & x=3/4 \end{array}$$

$$x = \{-3/4, 3/4\}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 5: Solving Quadratics by Factoring
(Day 1)

** This is a 2-page document! **

Solve each quadratic equation by factoring.

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

$$(x+4)(x+3) = 0$$

$x+4=0$	$x+3=0$
$x=-4$	$x=-3$

$$x = \{-4, -3\}$$

2. $x^2 - 8x - 9 = 0$

$$(x-9)(x+1) = 0$$

$x-9=0$	$x+1=0$
$x=9$	$x=-1$

$$x = \{-1, 9\}$$

3. $x^2 - x - 30 = 0$

$$(x-6)(x+5) = 0$$

$x-6=0$	$x+5=0$
$x=6$	$x=-5$

$$x = \{-5, 6\}$$

4. $x^2 - 8x + 15 = 0$

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

$x-5=0$	$x-3=0$
$x=5$	$x=3$

$$x = \{3, 5\}$$

5. $x^2 - 10 = 9x$

$$x^2 - 9x - 10 = 0$$

$$(x-10)(x+1) = 0$$

$x-10=0$	$x+1=0$
$x=10$	$x=-1$

$$x = \{-1, 10\}$$

6. $x^2 + 12x = x - 24$

$$x^2 + 11x + 24 = 0$$

$$(x+8)(x+3) = 0$$

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

$$x = \{-8, -3\}$$

7. $x^2 - 10x + 16 = 7x$

$$x^2 - 17x + 16 = 0$$

$$(x-16)(x-1) = 0$$

$x-16=0$	$x-1=0$
$x=16$	$x=1$

$$x = \{1, 16\}$$

8. $x^2 + 3x - 5 = -1$

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

$$(x+4)(x-1) = 0$$

$x+4=0$	$x-1=0$
$x=-4$	$x=1$

$$x = \{-4, 1\}$$

9. $x^2 - 46 = 3x - 1$

$$x^2 - 3x - 45 = 0$$

$$(x-9)(x+5) = 0$$

$x-9=0$	$x+5=0$
$x=9$	$x=-5$

$$x = \{-5, 9\}$$

10. $x^2 - 14x - 18 = -8x - 2$

$$x^2 - 6x - 16 = 0$$

$$(x-8)(x+2) = 0$$

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

$$x = \{-2, 8\}$$

$$11. 2x^2 - 7x + 4 = x^2 - 8$$

$$x^2 - 7x + 12 = 0$$

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

$$\begin{array}{l|l} x-4=0 & x-3=0 \end{array}$$

$$\begin{array}{l|l} x=4 & x=3 \end{array}$$

$$x = \{3, 4\}$$

$$12. x^2 + x + 53 = 4 - 13x$$

$$x^2 + 14x + 49 = 0$$

$$(x+7)(x+7) = 0$$

$$\begin{array}{l|l} x+7=0 & x+7=0 \end{array}$$

$$\begin{array}{l|l} x=-7 & x=-7 \end{array}$$

$$x = \{-7\}$$

$$13. x^2 + 3x = 0$$

$$x(x+3) = 0$$

$$\begin{array}{l|l} x=0 & x+3=0 \end{array}$$

$$\begin{array}{l|l} & x=-3 \end{array}$$

$$x = \{-3, 0\}$$

$$14. 8x^2 - 10x = 0$$

$$2x(4x-5) = 0$$

$$\begin{array}{l|l} 2x=0 & 4x-5=0 \end{array}$$

$$\begin{array}{l|l} x=0 & x=5/4 \end{array}$$

$$x = \{0, 5/4\}$$

$$15. 6x^2 - 2x = x$$

$$6x^2 - 3x = 0$$

$$3x(2x-1) = 0$$

$$\begin{array}{l|l} 3x=0 & 2x-1=0 \end{array}$$

$$\begin{array}{l|l} x=0 & x=1/2 \end{array}$$

$$x = \{0, 1/2\}$$

$$16. 9x^2 - 36x = 0$$

$$9x^2 - 36x = 0$$

$$9x(x-4) = 0$$

$$\begin{array}{l|l} 9x=0 & x-4=0 \end{array}$$

$$\begin{array}{l|l} x=0 & x=4 \end{array}$$

$$x = \{0, 4\}$$

$$17. x^2 - 36 = 0$$

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

$$\begin{array}{l|l} x+6=0 & x-6=0 \end{array}$$

$$\begin{array}{l|l} x=-6 & x=6 \end{array}$$

$$x = \{-6, 6\}$$

$$18. 16x^2 - 49 = 0$$

$$(4x+7)(4x-7) = 0$$

$$\begin{array}{l|l} 4x+7=0 & 4x-7=0 \end{array}$$

$$\begin{array}{l|l} x=-7/4 & x=7/4 \end{array}$$

$$x = \{-7/4, 7/4\}$$

$$19. 3x^2 - 1 = 1$$

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

$$(3x+1)(3x-1) = 0$$

$$\begin{array}{l|l} 3x+1=0 & 3x-1=0 \end{array}$$

$$\begin{array}{l|l} x=-1/3 & x=1/3 \end{array}$$

$$x = \{-1/3, 1/3\}$$

$$20. 3x^2 - 21 = 4 - x^2$$

$$4x^2 - 25 = 0$$

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

$$\begin{array}{l|l} 2x+5=0 & 2x-5=0 \end{array}$$

$$\begin{array}{l|l} x=-5/2 & x=5/2 \end{array}$$

$$x = \{-5/2, 5/2\}$$

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

SOLVING QUADRATICS By Factoring (DAY 2!)

Example 1: $3x^2 + 9x - 12 = 0$

$$3(x^2 + 3x - 4) = 0$$

$$3(x+4)(x-1) = 0$$

$3 \neq 0$	$x+4=0$ $x=-4$	$x-1=0$ $x=1$
------------	-------------------	------------------

$$x = \{-4, 1\}$$

Example 2: $5x^2 - 20x + 15 = 0$

$$5(x^2 - 4x + 3) = 0$$

$$5(x-6)(x+2) = 0$$

$5 \neq 0$	$x-6=0$ $x=6$	$x+2=0$ $x=-2$
------------	------------------	-------------------

$$x = \{-2, 6\}$$

Example 3: $2x^2 + 3x - 2 = 0$

$$x^2 + 3x - 1 = 0$$

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

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

$2x+5=0$ $x=-\frac{5}{2}$	$x-1=0$ $x=1$
------------------------------	------------------

$$x = \{-\frac{5}{2}, 1\}$$

Example 4: $8x^2 - 22x + 5 = 0$

$$2x^2 - 11x + 5 = 0$$

$$(x-2)(x-2) = 0$$

$$(2x-5)(4x-1) = 0$$

$2x-5=0$ $x=\frac{5}{2}$	$4x-1=0$ $x=\frac{1}{4}$
-----------------------------	-----------------------------

$$x = \{\frac{1}{4}, \frac{5}{2}\}$$

YOU TRY!

Solve the following quadratic equations by factoring.

1. $2x^2 + 9x + 8 = 0$

$$2(x^2 + 4.5x + 4) = 0$$

$$2(x+4)(x+1) = 0$$

$2 \neq 0$	$x+4=0$ $x=-4$	$x+1=0$ $x=-1$
------------	-------------------	-------------------

$$x = \{-4, -1\}$$

2. $4x^2 - 24x - 28 = 0$

$$4(x^2 - 6x - 7) = 0$$

$$4(x-7)(x+1) = 0$$

$4 \neq 0$	$x-7=0$ $x=7$	$x+1=0$ $x=-1$
------------	------------------	-------------------

$$x = \{-1, 7\}$$

3. $3x^2 + 13x - 10 = 0$

$$x^2 + 13x - 30 = 0$$

$$(x+15)(x-2) = 0$$

$$(x+6)(3x-2) = 0$$

$x+6=0$ $x=-6$	$3x-2=0$ $x=\frac{2}{3}$
-------------------	-----------------------------

$$x = \{-6, \frac{2}{3}\}$$

4. $5x^2 - 8x + 3 = 0$

$$x^2 - 8x + 15 = 0$$

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

$$(x-1)(5x-3) = 0$$

$x-1=0$ $x=1$	$5x-3=0$ $x=\frac{3}{5}$
------------------	-----------------------------

$$x = \{\frac{3}{5}, 1\}$$

$$\begin{aligned}
 5. \quad & 2x^2 + 13x - 7 = 0 \\
 & x^2 + 13x - 14 = 0 \\
 & (x + \frac{14}{2})(x - \frac{1}{2}) = 0 \\
 & \frac{(x+7)(2x-1)}{2} = 0 \\
 & \begin{array}{l|l} x+7=0 & 2x-1=0 \\ \hline x=-7 & x=\frac{1}{2} \end{array}
 \end{aligned}$$

$$x = \left\{ -7, \frac{1}{2} \right\}$$

$$\begin{aligned}
 6. \quad & 6x^2 + 5x + 1 = 0 \\
 & x^2 + 5x + 6 = 0 \\
 & (x+2)(x+3) = 0 \\
 & \frac{(3x+1)(2x+1)}{6} = 0 \\
 & \begin{array}{l|l} 3x+1=0 & 2x+1=0 \\ \hline x=-\frac{1}{3} & x=-\frac{1}{2} \end{array}
 \end{aligned}$$

$$x = \left\{ -\frac{1}{2}, -\frac{1}{3} \right\}$$

$$\begin{aligned}
 7. \quad & 4x^2 - 8x - 5 = 0 \\
 & x^2 - 8x - 20 = 0 \\
 & (x-10)(x+2) = 0 \\
 & \frac{(2x-5)(2x+1)}{4} = 0 \\
 & \begin{array}{l|l} 2x-5=0 & 2x+1=0 \\ \hline x=\frac{5}{2} & x=-\frac{1}{2} \end{array}
 \end{aligned}$$

$$x = \left\{ \frac{5}{2}, -\frac{1}{2} \right\}$$

$$\begin{aligned}
 8. \quad & x^2 + 12x + 36 = 0 \\
 & (x+6)(x+6) = 0 \\
 & \frac{(x+3)(x+3)}{1} = 0 \\
 & \begin{array}{l|l} x+3=0 & x+3=0 \\ \hline x=-3 & x=-3 \end{array}
 \end{aligned}$$

$$x = \left\{ -\frac{3}{2} \right\}$$

$$\begin{aligned}
 9. \quad & 3x^2 + 7x + 2 = 0 \\
 & x^2 + 7x + 6 = 0 \\
 & (x+1)(x+6) = 0 \\
 & \frac{(x+1)(3x+1)}{3} = 0 \\
 & \begin{array}{l|l} x+1=0 & 3x+1=0 \\ \hline x=-1 & x=-\frac{1}{3} \end{array}
 \end{aligned}$$

$$x = \left\{ -2, -\frac{1}{3} \right\}$$

$$\begin{aligned}
 10. \quad & 8x^2 + 3 = 10x \\
 & 8x^2 - 10x + 3 = 0 \\
 & x^2 - 10x + 24 = 0 \\
 & (x-6)(x-4) = 0 \\
 & \frac{(4x-3)(2x-1)}{8} = 0 \\
 & \begin{array}{l|l} 4x-3=0 & 2x-1=0 \\ \hline x=\frac{3}{4} & x=\frac{1}{2} \end{array}
 \end{aligned}$$

$$x = \left\{ \frac{1}{2}, \frac{3}{4} \right\}$$

$$\begin{aligned}
 11. \quad & 12x^2 + 32x - 5 = 0 \\
 & x^2 + 32x - 60 = 0 \\
 & (x+30)(x-2) = 0 \\
 & \frac{(2x+5)(6x+1)}{12} = 0 \\
 & \begin{array}{l|l} 2x+5=0 & 6x+1=0 \\ \hline x=-\frac{5}{2} & x=-\frac{1}{6} \end{array}
 \end{aligned}$$

$$x = \left\{ -\frac{5}{2}, -\frac{1}{6} \right\}$$

$$\begin{aligned}
 12. \quad & 5x^2 + 7x - 2 = 0 \\
 & 4x^2 + 7x - 2 = 0 \\
 & x^2 + 7x - 8 = 0 \\
 & (x+8)(x-1) = 0 \\
 & \frac{(x+2)(4x-1)}{4} = 0 \\
 & \begin{array}{l|l} x+2=0 & 4x-1=0 \\ \hline x=-2 & x=\frac{1}{4} \end{array}
 \end{aligned}$$

$$x = \left\{ -2, \frac{1}{4} \right\}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 6: Solving Quadratics by Factoring
(Day 2)

** This is a 2-page document! **

Solve each quadratic equation by factoring.

1. $2x^2 - 8x - 24 = 0$

$2(x^2 - 4x - 12) = 0$

$2(x-6)(x+2) = 0$

$2 \neq 0$	$x-6=0$	$x+2=0$
	$x=6$	$x=-2$

$x = \{-2, 6\}$

2. $5x^2 + 5x - 30 = 0$

$5(x^2 + x - 6) = 0$

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

$5 \neq 0$	$x+3=0$	$x-2=0$
	$x=-3$	$x=2$

$x = \{-3, 2\}$

3. $4x^2 + 12x + 8 = 0$

$4(x^2 + 3x + 2) = 0$

$4(x+1)(x+2) = 0$

$4 \neq 0$	$x+1=0$	$x+2=0$
	$x=-1$	$x=-2$

$x = \{-2, -1\}$

4. $15x^2 + 12x - 8 = 0$

$3(5x^2 + 4x - \frac{8}{3}) = 0$

$3(x-4)(x+1) = 0$

$3 \neq 0$	$x-4=0$	$x+1=0$
	$x=4$	$x=-1$

$x = \{1, 4\}$

5. $3x^2 - 7x - 6 = 0$

$x^2 - 7x - 18 = 0$

$(x-9)(x+2) = 0$

$\frac{1}{3}(x-9)(x+2) = 0$

$(x-3)(x-3) = 0$

$(x-3)^2 = 0$

$x-3=0$

$x=3$

$x = \{-\frac{2}{3}, 3\}$

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

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

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

$\frac{1}{2}(x+2)(x+3) = 0$

$(x+1)(2x+3) = 0$

$x+1=0$	$2x+3=0$
$x=-1$	$x=-\frac{3}{2}$

$x = \{-\frac{3}{2}, -1\}$

$x = \{-\frac{3}{2}, -1\}$

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

$x(2x-5) = 0$

$x(2x-5) = 0$

$x(2x-5) = 0$

$(x-5)(4x+1) = 0$

$x-5=0$	$4x+1=0$
$x=5$	$x=-\frac{1}{4}$

$x = \{-\frac{1}{4}, 5\}$

$x = \{-\frac{1}{4}, 5\}$

8. $10x^2 - x - 2 = 0$

$x^2 - x - 2 = 0$

$(x-5)(x+4) = 0$

$\frac{1}{10}(x-5)(x+4) = 0$

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

$2x-1=0$	$5x+2=0$
$x=\frac{1}{2}$	$x=-\frac{2}{5}$

$x = \{-\frac{2}{5}, \frac{1}{2}\}$

$x = \{-\frac{2}{5}, \frac{1}{2}\}$

$$9. 6x^2 + 7x + 2 = 0$$

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

$$(x + \frac{4}{6})(x + \frac{3}{6}) = 0$$

$$(3x + 2)(2x + 1) = 0$$

$$\begin{array}{l|l} 3x + 2 = 0 & 2x + 1 = 0 \end{array}$$

$$\begin{array}{l|l} x = -\frac{2}{3} & x = -\frac{1}{2} \end{array}$$

$$x = \left\{ -\frac{1}{2}, -\frac{2}{3} \right\}$$

$$10. 12x^2 - 11x + 2 = 0$$

$$x^2 - 11x + 24 = 0$$

$$(x - \frac{8}{12})(x - \frac{3}{12}) = 0$$

$$(3x - 2)(4x - 1) = 0$$

$$\begin{array}{l|l} 3x - 2 = 0 & 4x - 1 = 0 \end{array}$$

$$\begin{array}{l|l} x = \frac{2}{3} & x = \frac{1}{4} \end{array}$$

$$x = \left\{ \frac{1}{4}, \frac{2}{3} \right\}$$

$$11. 3x^2 - 14x = 5$$

$$3x^2 - 14x - 5 = 0$$

$$x^2 - 14x - 15 = 0$$

$$(x - \frac{15}{3})(x + \frac{1}{3}) = 0$$

$$(x - 5)(3x + 1) = 0$$

$$\begin{array}{l|l} x - 5 = 0 & 3x + 1 = 0 \end{array}$$

$$\begin{array}{l|l} x = 5 & x = -\frac{1}{3} \end{array}$$

$$x = \left\{ 5, -\frac{1}{3} \right\}$$

$$12. 2x^2 + 14 = 0$$

$$2x^2 - 14x + 14 = 0$$

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

$$(x - \frac{7}{2})(x - \frac{7}{2}) = 0$$

$$(x - 3.5)(x - 3.5) = 0$$

$$\begin{array}{l|l} x - 3.5 = 0 & x - 3.5 = 0 \end{array}$$

$$\begin{array}{l|l} x = 3.5 & x = 3.5 \end{array}$$

$$x = \left\{ 3.5, 3.5 \right\}$$

$$13. 8 - 3x = 5x^2$$

$$0 = 5x^2 + 3x - 8$$

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

$$0 = (x + \frac{8}{5})(x - 5) = 0$$

$$(5x + 8)(x - 5) = 0$$

$$\begin{array}{l|l} 5x + 8 = 0 & x - 5 = 0 \end{array}$$

$$\begin{array}{l|l} x = -\frac{8}{5} & x = 5 \end{array}$$

$$x = \left\{ -\frac{8}{5}, 5 \right\}$$

$$5x + 11 = -6x^2$$

$$x^2 + 25x + 11 = 0$$

$$x^2 + 25x + 66 = 0$$

$$(x + \frac{22}{6})(x + \frac{3}{6}) = 0$$

$$(3x + 11)(2x + 1) = 0$$

$$\begin{array}{l|l} 3x + 11 = 0 & 2x + 1 = 0 \end{array}$$

$$\begin{array}{l|l} x = -\frac{11}{3} & x = -\frac{1}{2} \end{array}$$

$$x = \left\{ -\frac{11}{3}, -\frac{1}{2} \right\}$$

$$15. 12x^2 - 17x + 5 = 0$$

$$12x^2 - 17x - 5 = 0$$

$$x^2 - 17x - 60 = 0$$

$$(x - \frac{20}{12})(x + \frac{3}{12}) = 0$$

$$(3x - 5)(4x + 1) = 0$$

$$\begin{array}{l|l} 3x - 5 = 0 & 4x + 1 = 0 \end{array}$$

$$\begin{array}{l|l} x = \frac{5}{3} & x = -\frac{1}{4} \end{array}$$

$$x = \left\{ \frac{5}{3}, -\frac{1}{4} \right\}$$

$$16. 9 = 12x - 4x^2$$

$$4x^2 - 12x + 9 = 0$$

$$x^2 - 12x + 36 = 0$$

$$(x - \frac{6}{4})(x - \frac{6}{4}) = 0$$

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

$$\begin{array}{l|l} 2x - 3 = 0 & 2x - 3 = 0 \end{array}$$

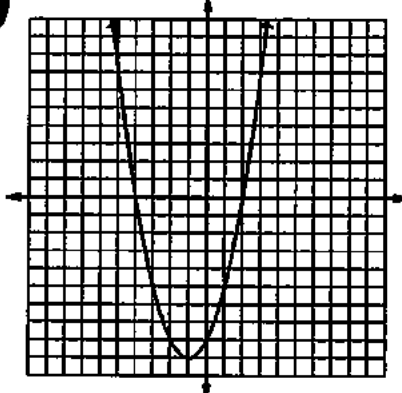
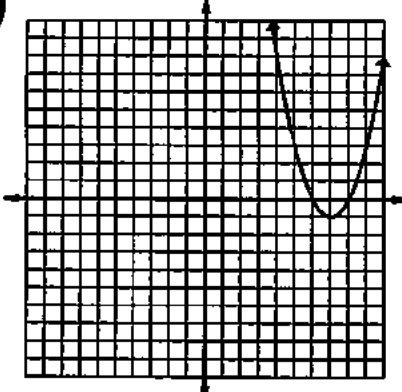
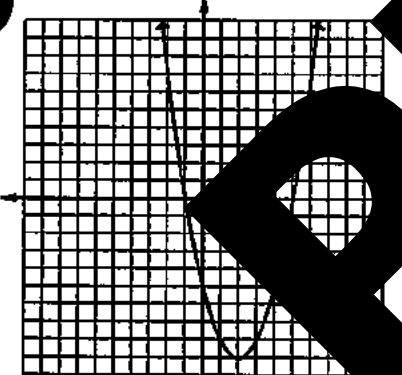
$$\begin{array}{l|l} x = \frac{3}{2} & x = \frac{3}{2} \end{array}$$

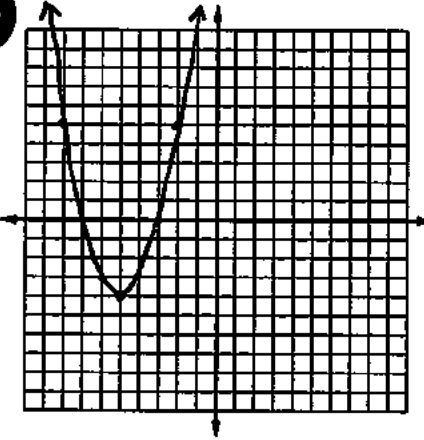
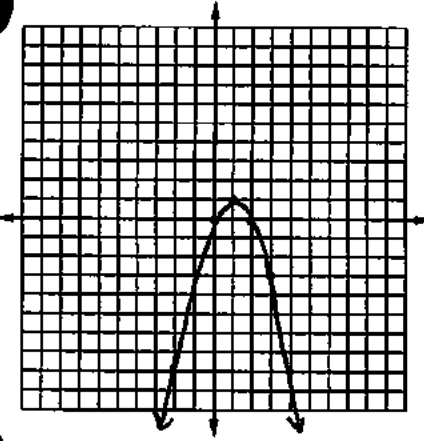
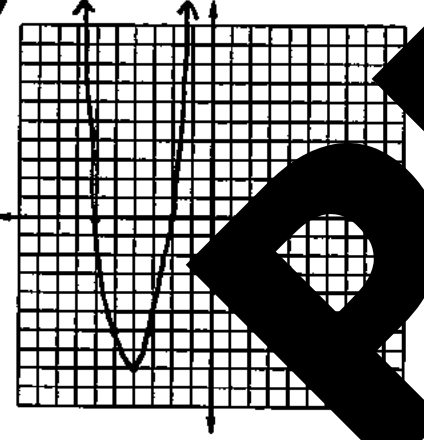
$$x = \left\{ \frac{3}{2} \right\}$$

Representing QUADRATIC EQUATIONS

Quadratic equations can be represented in vertex form, standard form, or factored form.

Complete each row of the chart below with the given information.

1	GRAPH	VERTEX FORM	STANDARD FORM	FACTORED FORM
		$y = (x+1)^2 - 9$	$y = (x+1)(x+1) - 9$ $y = x^2 + 2x + 1 - 9$ $y = x^2 + 2x - 8$	$y = (x+4)(x-2)$
		$y = (x-7)^2 - 1$	$y = (x-7)(x-7) - 1$ $y = x^2 - 7x - 7x + 49 - 1$ $y = x^2 - 14x + 48$	$y = (x-8)(x-6)$
		$y = (x-2)^2 - 9$	$y = (x-2)(x-2) - 9$ $y = x^2 - 2x - 2x + 4 - 9$ $y = x^2 - 4x - 5$	$y = (x-5)(x+1)$

GRAPH	VERTEX FORM	STANDARD FORM	FACTORED FORM
4 	$y = (x + 5)^2 - 4$	$y = (x + 5)(x + 5) - 4$ $y = x^2 + 10x + 25 - 4$ $y = x^2 + 10x + 21$	$y = (x + 7)(x + 3)$
5 	$y = -(x - 1)^2 + 1$	$y = -(x - 1)(x - 1) + 1$ $y = -(x^2 - 2x + 1) + 1$ $y = -x^2 + 2x$	$y = -x(x - 2)$
6 	$y = 2(x + 4)^2 - 8$	$y = 2(x + 4)(x + 4) - 8$ $y = 2(x^2 + 8x + 16) - 8$ $y = 2x^2 + 16x + 24$	$y = 2(x^2 + 8x + 12)$ $y = 2(x + 6)(x + 2)$

Name: _____

Algebra I

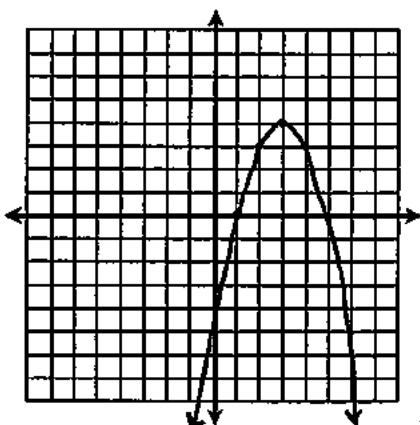
Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-2: Quadratic Roots; Solving Quadratics by Factoring**Find the zeros of each quadratic equation below by graphing.**

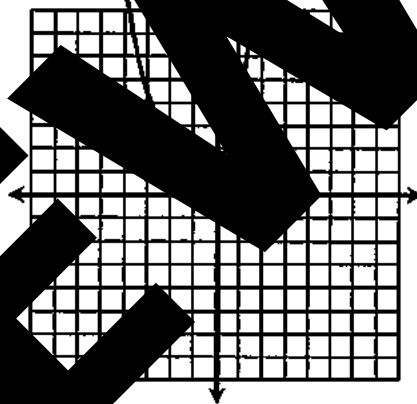
1. $y = -x^2 + 6x - 5$

x	y
1	0
2	3
3	4
4	3
5	0

Zeros: $x = \{1, 5\}$

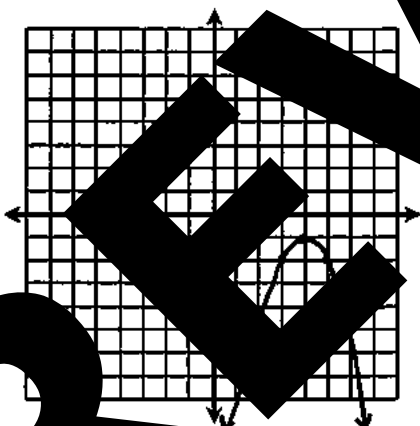
2. $y = x^2 + 2x + 1$

x	y
-3	4
-2	1
-1	0
0	1
1	4

Zeros: $x = \{-1\}$

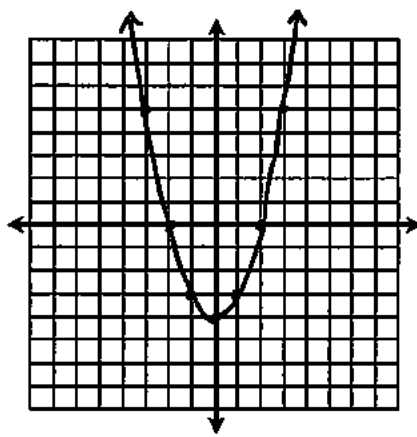
3. $y = -x^2 + 8x - 17$

x	y
2	-5
3	-2
4	-1
5	-2
6	-5

Zeros: $x = \{\}; \emptyset$

$y = x^2$

x	y
-2	0
-1	-3
0	-4
1	-3
2	0

Zeros: $x = \{-2, 2\}$ **Use the discriminant to determine the number of solutions for each quadratic equation.**

4. $y = x^2 - 10x + 25$

$b^2 - 4(1)(25)$

$100 - 100 = 0$

- ☐ 2 solutions
☒ 1 solution
☐ 0 solutions

5. $y = -3x^2 + 7x + 6$

$7^2 - 4(-3)(6)$

$49 + 72 = 121$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

7. $y = -x^2 - 5$

$b^2 - 4(-1)(-5)$

$0 - 20 = -20$

- ☐ 2 solutions
☐ 1 solution
☒ 0 solutions

8. $y = 2x^2 + 9x$

$9^2 - 4(2)(0)$

$81 - 0 = 81$

- ☒ 2 solutions
☐ 1 solution
☐ 0 solutions

Solve the following quadratic equations by factoring.

9. $x^2 + 5x - 24 = 0$

$$\begin{array}{l|l} (x+8)(x-3)=0 & \\ \hline x+8=0 & x-3=0 \\ x=-8 & x=3 \end{array}$$

10. $x^2 = 18x - 81$

$$\begin{array}{l|l} x^2 - 18x + 81 = 0 & \\ (x-9)(x-9) = 0 & \\ \hline x-9=0 & x-9=0 \\ x=9 & x=9 \end{array}$$

9. $x = \{-8, 3\}$

10. $x = \{9\}$

11. $x = \{-5\}$

12. $x = \{2, 4\}$

13. $x = \{1, 2\}$

14. $x = \{1, 2\}$

15. $x = \{1, 2\}$

16. $x = \{1, 2\}$

17. $x = \{-1, \frac{5}{3}\}$

18. $x = \{-1, \frac{5}{3}\}$

11. $3x^2 + 9x - 30 = 0$

$$\begin{array}{l|l} 3(x^2 + 3x - 10) = 0 & \\ 3(x+5)(x-2) = 0 & \\ \hline 3 \neq 0 & \begin{array}{l|l} x+5=0 & x-2=0 \\ x=-5 & x=2 \end{array} \end{array}$$

12. $5x^2 - 25x = 5x - 40$

$$\begin{array}{l|l} 5x^2 - 30x + 40 = 0 & \\ 5(x^2 - 6x + 8) = 0 & \\ 5(x-4)(x-2) = 0 & \\ \hline 5 \neq 0 & \begin{array}{l|l} x-4=0 & x-2=0 \\ x=4 & x=2 \end{array} \end{array}$$

19. $x = \{1, 2\}$

20. $x = \{1, 2\}$

21. $x = \{-1, \frac{5}{3}\}$

22. $x = \{-1, \frac{5}{3}\}$

13. $6x^2 - x - 2 = 0$

$$\begin{array}{l} x^2 - x - 12 = 0 \\ (x-4)(x+3) = 0 \\ \frac{1}{6} \quad \frac{1}{6} \end{array}$$

$$\begin{array}{l|l} (3x-2)(2x+1) = 0 & \\ \hline 3x-2=0 & 2x+1=0 \\ x=\frac{2}{3} & x=-\frac{1}{2} \end{array}$$

14. $2x^2 - 31x - 2 = 0$

$$\begin{array}{l} 4x^2 - 31x - 2 = 0 \\ (4x+1)(x-2) = 0 \\ \frac{1}{4} \quad \frac{1}{4} \end{array}$$

$$\begin{array}{l|l} (x-8)(4x+1) = 0 & \\ \hline x-8=0 & 4x+1=0 \\ x=8 & x=-\frac{1}{4} \end{array}$$

15. $10x^2 = 6x$

$$\begin{array}{l|l} 10x^2 - 6x = 0 & \\ 2x(5x-3) = 0 & \\ \hline 2x=0 & 5x-3=0 \\ x=0 & x=\frac{3}{5} \end{array}$$

16. $x^2 = 25$

$$\begin{array}{l|l} x^2 - 25 = 0 & \\ (x-5)(x+5) = 0 & \\ \hline x-5=0 & x+5=0 \\ x=5 & x=-5 \end{array}$$

17. $(3x+7)(x-3) = -16$

$$3x^2 - 9x + 7x - 21 + 16 = 0$$

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

$$x^2 - 2x - 15 = 0$$

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

$$\begin{array}{l|l} (3x-5)(x+1) = 0 & \\ \hline 3x-5=0 & x+1=0 \\ x=\frac{5}{3} & x=-1 \end{array}$$

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

SOLVING QUADRATICS by Square Roots

Quadratic equations of the form $ax^2 + c = 0$
(no "bx" term!) can be solved using square roots.

Steps

Example

① Isolate x^2 .

② Take the **SQUARE ROOT** of both sides.

$$x = \pm 7.7$$

REMEMBER THAT A POSITIVE NUMBER HAS TWO SQUARE ROOTS!

YOU TRY!

Directions: Solve the following quadratic equations by square roots.

1. $x^2 - 16 = 0$

$$\sqrt{x^2} = \sqrt{16}$$

$$x = \pm 4$$

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

2. $x^2 - 100 = 0$

$$\sqrt{x^2} = \sqrt{100}$$

$$x = \pm 10$$

$$x = \{-10, 10\}$$

3. $x^2 - 25 = 0$

$$\sqrt{x^2} = \sqrt{25}$$

$$x = \pm 5$$

$$\emptyset$$

4. $x^2 + 7 = 88$

$$\sqrt{x^2} = \sqrt{81}$$

$$x = \pm 9$$

$$x = \{-9, 9\}$$

5. $x^2 - 1 = 0$

$$\sqrt{x^2} = \sqrt{1}$$

$$x = \pm 1$$

$$x = \{-1, 1\}$$

6. $6x^2 = 54$

$$\sqrt{x^2} = \sqrt{9}$$

$$x = \pm 3$$

$$x = \{-3, 3\}$$

7. $-2x^2 = -98$

$$\sqrt{x^2} = \sqrt{49}$$

$$x = \pm 7$$

$$x = \{-7, 7\}$$

8. $\frac{3}{4}x^2 = 48$

$$\sqrt{x^2} = \sqrt{64}$$

$$x = \pm 8$$

$$x = \{-8, 8\}$$

9. $3x^2 - 108 = 0$

$$3x^2 = 108$$

$$\sqrt{x^2} = \sqrt{36}$$

$$x = \pm 6$$

$$x = \{-6, 6\}$$

10. $5x^2 - 45 = 0$

$$5x^2 = 45$$

$$\sqrt{x^2} = \sqrt{9}$$

$$x = \pm 3$$

$$x = \{-3, 3\}$$

	11. $7x^2 + 66 = 3$ $7x^2 = -63$ $\sqrt{x^2} = \sqrt{-9}$ $x = \emptyset$	12. $\frac{1}{2}x^2 + 3 = 75$ $\frac{1}{2}x^2 = 72$ $\sqrt{x^2} = \sqrt{144}$ $x = \pm 12$
	13. $9x^2 - 16 = 0$ $9x^2 = 16$ $\sqrt{x^2} = \sqrt{\frac{16}{9}}$ $x = \pm \frac{4}{3}$	14. $25x^2 + 10 = 46$ $25x^2 = 36$ $\sqrt{x^2} = \sqrt{\frac{36}{25}}$ $x = \pm \frac{6}{5}$
	15. $5x^2 - 1 = x^2$ $4x^2 - 1 = 0$ $4x^2 = 1$ $\sqrt{x^2} = \sqrt{\frac{1}{4}}$ $x = \pm \frac{1}{2}$	16. $16x^2 - 24 = 15$ $16x^2 = 39$ $\sqrt{x^2} = \sqrt{\frac{39}{16}}$ $x = \pm \frac{\sqrt{39}}{4}$
IRRATIONAL SOLUTIONS	Zeros can be irrational! Solve the following quadratic equations. Write answers in radical form.	
	17. $x^2 - 3 = 0$ $\sqrt{x^2} = \sqrt{3}$ $x = \pm \sqrt{3}$	18. $x^2 - 8 = 0$ $\sqrt{x^2} = \sqrt{8}$ $x = \pm \sqrt{4} \sqrt{2}$ $x = \pm 2\sqrt{2}$
	19. $x^2 = 56$ $\sqrt{x^2} = \sqrt{56}$ $x = \pm \sqrt{49} \sqrt{3}$ $x = \pm 7\sqrt{3}$	20. $x^2 - 16 = 59$ $\sqrt{x^2} = \sqrt{75}$ $x = \pm \sqrt{25} \sqrt{3}$ $x = \pm 5\sqrt{3}$
	21. $2x^2 - 126 = 0$ $2x^2 = 126$ $\sqrt{x^2} = \sqrt{63}$ $x = \pm \sqrt{9} \sqrt{7}$ $x = \pm 3\sqrt{7}$	22. $8 - 3x^2 = -22$ $-3x^2 = -30$ $\sqrt{x^2} = \sqrt{10}$ $x = \pm \sqrt{10}$
	23. $-x^2 - 10 = 18$ $-x^2 = 28$ $\sqrt{x^2} = \sqrt{-28}$ $x = \emptyset$	24. $\frac{1}{2}x^2 - 11 = 25$ $\frac{1}{2}x^2 = 36$ $\sqrt{x^2} = \sqrt{72}$ $x = \pm \sqrt{36} \sqrt{2}$ $x = \pm 6\sqrt{2}$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 7: Solving Quadratics
by Square Roots**** This is a 2-page document! ******Solve each quadratic equation by the square roots method. Simply all irrational solutions.**

1. $x^2 - 64 = 0$

$\sqrt{x^2} = \sqrt{64}$

$x = \pm 8$

$x = \{-8, 8\}$

2. $2x^2 - 18 = 0$

$2x^2 = 18$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$x = \{-3, 3\}$

3. $5x^2 - 20 = 0$

$5x^2 = 20$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

$x = \{-2, 2\}$

4. $x^2 - 81 = 0$

$\sqrt{x^2} = \sqrt{-81}$

$x = \pm \sqrt{-81}$

$\emptyset$

5. $x^2 - 24 = 57$

$\sqrt{x^2} = \sqrt{81}$

$x = \pm 9$

$x = \{-9, 9\}$

6. $x^2 - 22 = 28$

$x^2 = 50$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

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

7. $\frac{2}{3}x^2 = 36$

$\sqrt{x^2} = \sqrt{36}$

$x = \pm 6$

$x = \{-6, 6\}$

8. $\frac{1}{4}x^2 - 1 = 15$

$\frac{1}{4}x^2 = 16$

$\sqrt{x^2} = \sqrt{64}$

$x = \pm 8$

$x = \{-8, 8\}$

9. $4x^2 - 25 = 0$

$4x^2 = 25$

$\sqrt{x^2} = \sqrt{\frac{25}{4}}$

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

$x = \{-\frac{5}{2}, \frac{5}{2}\}$

10. $9x^2 = 49$

$\sqrt{x^2} = \sqrt{\frac{49}{9}}$

$x = \pm \frac{7}{3}$

$x = \{-\frac{7}{3}, \frac{7}{3}\}$

11. $81x^2 = 4$ $\sqrt{x^2} = \sqrt{\frac{4}{81}}$ $x = \pm \frac{2}{9}$ $x = \{-\frac{2}{9}, \frac{2}{9}\}$	12. $2x^2 - 7 = -7$ $2x^2 = 0$ $\sqrt{x^2} = \sqrt{0}$ $x = 0$ $x = \{0\}$
13. $4x^2 + 11 = 12$ $4x^2 = 1$ $\sqrt{x^2} = \sqrt{\frac{1}{4}}$ $x = \pm \frac{1}{2}$ $x = \{-\frac{1}{2}, \frac{1}{2}\}$	14. $49x^2 - 3 = 13$ $49x^2 = 16$ $\sqrt{x^2} = \sqrt{\frac{16}{49}}$ $x = \pm \frac{4}{7}$ $x = \{-\frac{4}{7}, \frac{4}{7}\}$
15. $x^2 - 6 = 0$ $\sqrt{x^2} = \sqrt{6}$ $x = \pm \sqrt{6}$ $x = \{-\sqrt{6}, \sqrt{6}\}$	16. $x^2 = 50$ $\sqrt{x^2} = \sqrt{50}$ $x = \pm 5\sqrt{2}$ $x = \{5\sqrt{2}, 5\sqrt{2}\}$
17. $2x^2 - 90 = 0$ $2x^2 = 90$ $\sqrt{x^2} = \sqrt{45}$ $x = \pm \sqrt{9} \sqrt{5}$ $x = \pm 3\sqrt{5}$ $x = \{-3\sqrt{5}, 3\sqrt{5}\}$	18. $x^2 - 15 = 45$ $x^2 = 60$ $\sqrt{x^2} = \sqrt{12}$ $x = \pm \sqrt{4} \sqrt{3}$ $x = \pm 2\sqrt{3}$ $x = \{2\sqrt{3}, 2\sqrt{3}\}$
19. $4x^2 = 80$ $x^2 = 20$ $\sqrt{x^2} = \sqrt{16} \sqrt{5}$ $x = \pm 4\sqrt{5}$ $x = \{4\sqrt{5}, 4\sqrt{5}\}$	20. $-2x^2 + 50 = 2$ $-2x^2 = -48$ $\sqrt{x^2} = \sqrt{24}$ $x = \pm \sqrt{4} \sqrt{6}$ $x = \pm 2\sqrt{6}$ $x = \{-2\sqrt{6}, 2\sqrt{6}\}$
21. $\frac{1}{2}x^2 = 18$ $\frac{1}{2}x^2 = 30$ $\sqrt{x^2} = \sqrt{60}$ $x = \pm \sqrt{4} \sqrt{15}$ $x = \pm 2\sqrt{15}$ $x = \{-2\sqrt{15}, 2\sqrt{15}\}$	22. $\frac{3}{2}x^2 + 11 = 71$ $\frac{3}{2}x^2 = 60$ $\sqrt{x^2} = \sqrt{40}$ $x = \pm \sqrt{4} \sqrt{10}$ $x = \pm 2\sqrt{10}$ $x = \{-2\sqrt{10}, 2\sqrt{10}\}$

Name: _____		Date: _____	
Topic: _____		Class: _____	

Main Ideas/Questions	Notes/Examples															
WARM-UP: Perfect Square Trinomials	Factor the following trinomials: $x^2 + 8x + 16 = (x+4)^2$ $x^2 + 2x + 1 = (x+1)^2$ $x^2 - 18x + 81 = (x-9)^2$ $x^2 - 10x + 25 = (x-5)^2$ These are called perfect square trinomials. If you have a perfect square trinomial, you can solve the quadratic equation by square roots!															
EXAMPLES	Directions: Factor the perfect square trinomial and solve the equation by square roots. Remember a positive number has two square roots, so you must solve for both cases. 1. $x^2 + 4x + 4 = 25$ $\sqrt{(x+2)^2} = \sqrt{25}$ $x+2 = \pm 5$ $x = -2 \pm 5$ $x = \{-7, 3\}$ 2. $x^2 - 6x + 9 = 81$ $\sqrt{(x-3)^2} = \sqrt{81}$ $x-3 = \pm 9$ $x = 3 \pm 9$ $x = \{-3, 15\}$ 3. $x^2 - 14x + 49 = 4$ $\sqrt{(x-7)^2} = \sqrt{4}$ $x-7 = \pm 2$ $x = 7 \pm 2$ $x = \{5, 9\}$ 4. $x^2 + 6x + 9 = 1$ $\sqrt{(x+3)^2} = \sqrt{1}$ $x+3 = \pm 1$ $x = -3 \pm 1$ $x = \{-4, -2\}$															
COMPLETING THE SQUARE (where $a = 1$)	When you do not have a perfect square trinomial, you can create one. This process is called completing the square. Follow the steps below to solve the equation by completing the square. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th style="width: 50%;">Steps</th> <th style="width: 40%;">Example</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Rewrite as $x^2 + bx = c$</td> <td> $x^2 + 8x + 7 = 0$ $x^2 + 8x = -7$ </td> </tr> <tr> <td style="text-align: center;">2</td> <td>Take half of b, square it, then add this to both sides.</td> <td> $(4)^2 = 16$ $x^2 + 8x + 16 = -7 + 16$ </td> </tr> <tr> <td style="text-align: center;">3</td> <td>Factor the perfect square trinomial.</td> <td> $\sqrt{(x+4)^2} = \sqrt{9}$ $x+4 = \pm 3$ </td> </tr> <tr> <td style="text-align: center;">4</td> <td>Take the square root of both sides and solve for both cases.</td> <td> $x = -4 \pm 3$ $x = \{-7, -1\}$ </td> </tr> </tbody> </table>		Steps	Example	1	Rewrite as $x^2 + bx = c$	$x^2 + 8x + 7 = 0$ $x^2 + 8x = -7$	2	Take half of b , square it, then add this to both sides.	$(4)^2 = 16$ $x^2 + 8x + 16 = -7 + 16$	3	Factor the perfect square trinomial.	$\sqrt{(x+4)^2} = \sqrt{9}$ $x+4 = \pm 3$	4	Take the square root of both sides and solve for both cases.	$x = -4 \pm 3$ $x = \{-7, -1\}$
	Steps	Example														
1	Rewrite as $x^2 + bx = c$	$x^2 + 8x + 7 = 0$ $x^2 + 8x = -7$														
2	Take half of b , square it, then add this to both sides.	$(4)^2 = 16$ $x^2 + 8x + 16 = -7 + 16$														
3	Factor the perfect square trinomial.	$\sqrt{(x+4)^2} = \sqrt{9}$ $x+4 = \pm 3$														
4	Take the square root of both sides and solve for both cases.	$x = -4 \pm 3$ $x = \{-7, -1\}$														

YOU TRY!

Directions: Solve each equation by completing the square.

5. $x^2 - 12x + 27 = 0$

$$x^2 - 12x = -27$$

$$(-6)^2 = 36$$

$$x^2 - 12x + 36 = -27 + 36$$

$$\sqrt{(x-6)^2} = \sqrt{9}$$

$$x-6 = \pm 3$$

$$x = 6 \pm 3$$

$$x = \{3, 9\}$$

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

$$x^2 + 4x = 5$$

$$(2)^2 = 4$$

$$x^2 + 4x + 4 = 5 + 4$$

$$\sqrt{(x+2)^2} = \sqrt{9}$$

$$x+2 = \pm 3$$

$$x = -2 \pm 3$$

$$x = \{-1, 1\}$$

7. $x^2 + 71 = 18x - 9$

$$x^2 - 18x = -80$$

$$(-9)^2 = 81$$

$$x^2 - 18x + 81 = -80 + 81$$

$$\sqrt{(x-9)^2} = \sqrt{1}$$

$$x-9 = \pm 1$$

$$x = 9 \pm 1$$

$$x = \{8, 10\}$$

8. $x^2 + 2x - 50 = -2$

$$x^2 + 2x = 48$$

$$1^2 = 1$$

$$x^2 + 2x + 1 = 48 + 1$$

$$\sqrt{(x+1)^2} = \sqrt{49}$$

$$x+1 = \pm 7$$

$$x = -1 \pm 7$$

$$x = \{-8, 6\}$$

IRRATIONAL SOLUTIONS

Directions: Solve each equation by completing the square. Simplify all irrational solutions.

9. $x^2 - 2x - 4 = 0$

$$x^2 - 2x = 4$$

$$1^2 = 1$$

$$x^2 - 2x + 1 = 4 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{5}$$

$$x-1 = \pm \sqrt{5}$$

$$x = \{1 \pm \sqrt{5}\}$$

10. $x^2 + 16x + 46 = 0$

$$x^2 + 16x = -46$$

$$8^2 = 64$$

$$x^2 + 16x + 64 = -46 + 64$$

$$\sqrt{(x+8)^2} = \sqrt{18}$$

$$x+8 = \pm \sqrt{18}$$

$$x+8 = \pm 3\sqrt{2}$$

$$x = \{-8 \pm 3\sqrt{2}\}$$

11. $x^2 + 7x + 7 = 66 - x$

$$x^2 + 8x = 59$$

$$4^2 = 16$$

$$x^2 + 8x + 16 = 59 + 16$$

$$\sqrt{(x+4)^2} = \sqrt{75}$$

$$x+4 = \pm 5\sqrt{3}$$

$$x = \{-4 \pm 5\sqrt{3}\}$$

12. $x^2 - 2 = 6x - 3$

$$x^2 - 6x = -1$$

$$(-3)^2 = 9$$

$$x^2 - 6x + 9 = -1 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{8}$$

$$x-3 = \pm 2\sqrt{2}$$

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

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 8: Solving Quadratics by
Completing the Square (Day 1)**** This is a 2-page document! ******Factor the perfect square trinomial, then solve the quadratic equation by square roots.**

1. $x^2 + 18x + 81 = 1$

$$\sqrt{(x+9)^2} = \sqrt{1}$$

$$x+9 = \pm 1$$

$$x = -9 \pm 1$$

$$x = \{-10, -8\}$$

2. $x^2 - 10x + 25 = 64$

$$\sqrt{(x-5)^2} = \sqrt{64}$$

$$x-5 = \pm 8$$

$$x = 5 \pm 8$$

$$x = \{-3, 13\}$$

3. $x^2 - 16x + 64 = 4$

$$\sqrt{(x-8)^2} = \sqrt{4}$$

$$x-8 = \pm 2$$

$$x = 8 \pm 2$$

$$x = \{6, 10\}$$

4. $x^2 + 12x + 36 = 49$

$$\sqrt{(x+6)^2} = \sqrt{49}$$

$$x+6 = \pm 7$$

$$x = -6 \pm 7$$

$$x = \{-8, 1\}$$

Solve each quadratic equation by completing the square. Simply all irrational solutions.

5. $x^2 - 6x - 16 = 0$

$$x^2 - 6x = 16$$

$$x^2 - 6x + 9 = 16 + 9$$

$$(x-3)^2 = 25$$

$$x-3 = \pm 5$$

$$x = 3 \pm 5$$

$$x = \{-2, 8\}$$

6. $x^2 - 20x + 19 = 0$

$$x^2 - 20x = -19$$

$$(x-10)^2 = 100$$

$$x^2 - 20x + 100 = -19 + 100$$

$$\sqrt{(x-10)^2} = \sqrt{81}$$

$$x-10 = \pm 9$$

$$x = 10 \pm 9$$

$$x = \{1, 19\}$$

8. $x^2 + 14x + 32 = -8$

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

$$(x+7)^2 = 49$$

$$x^2 + 14x + 49 = -40 + 49$$

$$\sqrt{(x+7)^2} = \sqrt{9}$$

$$x+7 = \pm 3$$

$$x = -7 \pm 3$$

$$x = \{-10, -4\}$$

$$9. x^2 + 41 = 12x + 9$$

$$x^2 - 12x = -32$$

$$\downarrow$$

$$(6)^2 = 36$$

$$x^2 - 12x + 36 = -32 + 36$$

$$\sqrt{(x-6)^2} = \sqrt{4}$$

$$x-6 = \pm 2$$

$$x = 6 \pm 2$$

$$x = \{4, 8\}$$

$$10. x^2 + 8x - 12 = 21$$

$$x^2 + 8x = 33$$

$$\downarrow$$

$$4^2 = 16$$

$$x^2 + 8x + 16 = 33 + 16$$

$$\sqrt{(x+4)^2} = \sqrt{49}$$

$$x+4 = \pm 7$$

$$x = -4 \pm 7$$

$$x = \{-11, 3\}$$

$$11. x^2 - x - 22 = x - 7$$

$$x^2 - 2x = 15$$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 15 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{16}$$

$$x-1 = \pm 4$$

$$x = 1 \pm 4$$

$$x = \{-3, 5\}$$

$$12. x^2 + 10x + 23 = 3$$

$$x^2 + 10x = -20$$

$$5^2 = 25$$

$$x^2 + 10x + 25 = -20 + 25$$

$$\sqrt{(x+5)^2} = \sqrt{5}$$

$$x+5 = \pm \sqrt{5}$$

$$x = -5 \pm \sqrt{5}$$

$$x = \{-5 + \sqrt{5}, -5 - \sqrt{5}\}$$

$$13. x^2 - 16x + 74 = 2x$$

$$x^2 - 18x = -74$$

$$\downarrow$$

$$(-9)^2 = 81$$

$$x^2 - 18x + 81 = -74 + 81$$

$$\sqrt{(x-9)^2} = \sqrt{7}$$

$$x-9 = \pm \sqrt{7}$$

$$x = 9 \pm \sqrt{7}$$

$$x^2 = 8x - 4$$

$$x^2 - 8x = -4$$

$$\downarrow$$

$$(-4)^2 = 16$$

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

$$\sqrt{(x-4)^2} = \sqrt{12}$$

$$x-4 = \pm \sqrt{12}$$

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

$$15. x^2 - 7 = 21$$

$$x^2 = 28$$

$$\downarrow$$

$$(-2)^2 = 4$$

$$x^2 - 7 + 4 = 21 + 4$$

$$\sqrt{(x-2)^2} = \sqrt{32}$$

$$x-2 = \pm \sqrt{32}$$

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

$$16. x^2 + 12 = 38 - 16x$$

$$x^2 + 16x = 26$$

$$\downarrow$$

$$8^2 = 64$$

$$x^2 + 16x + 64 = 26 + 64$$

$$\sqrt{(x+8)^2} = \sqrt{90}$$

$$x+8 = \pm \sqrt{90}$$

$$x = \{-8 \pm 3\sqrt{10}\}$$

Name:

Date:

Topic:

Class:

Main Ideas/Questions

Notes/Examples

COMPLETING THE SQUARE

(when $a > 1$)

Steps

- 1 Rewrite as $ax^2 + bx = c$
- 2 Divide the equation by a .
- 3 Take half of b , square it, then add this to both sides.
- 4 Factor the perfect square trinomial.
- 5 Take the square root of both sides and solve both cases.

Example

$$\begin{aligned}
 4x^2 + 8x &= -3 \\
 \frac{4x^2 + 8x}{4} &= \frac{-3}{4} \\
 x^2 + 2x &= -\frac{3}{4} \\
 \downarrow \\
 1^2 &= 1 \\
 x^2 + 2x + 1 &= -\frac{3}{4} + 1 \\
 (x+1)^2 &= \frac{1}{4} \\
 x+1 &= \pm \frac{1}{2} \\
 x &= -1 \pm \frac{1}{2} \\
 x &= \{-\frac{3}{2}, -\frac{1}{2}\}
 \end{aligned}$$

YOU TRY!

Directions: Solve each equation by completing the square.

1. $2x^2 - 8x + 6 = 0$

$$\begin{aligned}
 2x^2 - 8x &= -6 \\
 \frac{2x^2 - 8x}{2} &= \frac{-6}{2} \\
 x^2 - 4x &= -3 \\
 \downarrow \\
 2^2 &= 4 \\
 x^2 - 4x + 4 &= -3 + 4 \\
 (x-2)^2 &= 1 \\
 x-2 &= \pm 1 \\
 x &= 2 \pm 1 \\
 x &= \{1, 3\}
 \end{aligned}$$

2. $3x^2 - 18x - 48 = 0$

$$\begin{aligned}
 3x^2 - 18x &= 48 \\
 \frac{3x^2 - 18x}{3} &= \frac{48}{3} \\
 x^2 - 6x &= 16 \\
 \downarrow \\
 (-3)^2 &= 9 \\
 x^2 - 6x + 9 &= 16 + 9 \\
 (x-3)^2 &= 25 \\
 x-3 &= \pm 5 \\
 x &= 3 \pm 5 \\
 x &= \{-2, 8\}
 \end{aligned}$$

3. $5x^2 + 10x - 34 = 6$

$$\begin{aligned}
 5x^2 + 10x &= 40 \\
 \frac{5x^2 + 10x}{5} &= \frac{40}{5} \\
 x^2 + 2x &= 8 \\
 \downarrow \\
 1^2 &= 1 \\
 x^2 + 2x + 1 &= 8 + 1 \\
 (x+1)^2 &= 9 \\
 x+1 &= \pm 3 \\
 x &= -1 \pm 3 \\
 x &= \{-4, 2\}
 \end{aligned}$$

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

$$\begin{aligned}
 4x^2 + 8x &= -3 \\
 \frac{4x^2 + 8x}{4} &= \frac{-3}{4} \\
 x^2 + 2x &= -\frac{3}{4} \\
 \downarrow \\
 1^2 &= 1 \\
 x^2 + 2x + 1 &= -\frac{3}{4} + 1 \\
 (x+1)^2 &= \frac{1}{4} \\
 x+1 &= \pm \frac{1}{2} \\
 x &= -1 \pm \frac{1}{2} \\
 x &= \{-\frac{3}{2}, -\frac{1}{2}\}
 \end{aligned}$$

IRRATIONAL SOLUTIONS

5. $3x^2 - 24x - 44 = 1 - x^2$

$$\frac{4x^2 - 24x}{4} = \frac{45}{4}$$

$$x^2 - 6x = \frac{45}{4}$$

$$\downarrow$$

$$(-3)^2 = 9$$

$$x^2 - 6x + 9 = \frac{45}{4} + 9$$

$$\sqrt{(x-3)^2} = \sqrt{\frac{81}{4}}$$

$$x - 3 = \pm \frac{9}{2}$$

$$x = 3 \pm \frac{9}{2}$$

$$x = \left\{ \frac{-3}{2}, \frac{15}{2} \right\}$$

6. $\frac{8x^2 + 16x}{8} = \frac{90}{8}$

$$x^2 + 2x = \frac{45}{4}$$

↓

$$1^2 = 1$$

$$x^2 + 2x + 1 = \frac{45}{4} + 1$$

$$\sqrt{(x+1)^2} = \sqrt{\frac{49}{4}}$$

$$x + 1 =$$

$$x = -1 \pm \frac{7}{2}$$

$$x = \left\{ \frac{5}{2}, \frac{5}{2} \right\}$$

Directions: Solve each equation by completing the square. Simplify all irrational solutions.

7. $2x^2 - 16x + 22 = 0$

$$\frac{2x^2 - 16x}{2} = \frac{-22}{2}$$

$$x^2 - 8x = -11$$

↓

$$(-4)^2 = 16$$

$$x^2 - 8x + 16 = -11 + 16$$

$$\sqrt{(x-4)^2} = \sqrt{5}$$

$$x - 4 = \pm \sqrt{5}$$

$$x = 4 \pm \sqrt{5}$$

8. $4x^2 + 20x - 12 = 0$

$$\frac{4x^2 + 20x}{4} = \frac{12}{4}$$

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

↓

$$5^2 = 25$$

$$x^2 + 5x + 25 = 3 + 25$$

$$\sqrt{(x+5)^2} = \sqrt{28}$$

$$x + 5 = \pm \sqrt{28}$$

$$x = \left\{ -5 \pm 2\sqrt{7} \right\}$$

9. $3x^2 - 6x - 3 = 90$

$$\frac{3x^2 - 6x}{3} = \frac{93}{3}$$

$$x^2 - 2x = 31$$

↓

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 31 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{32}$$

$$x - 1 = \pm \sqrt{32}$$

$$x = 1 \pm 4\sqrt{2}$$

10. $5x^2 + 30x - 4 = 16$

$$\frac{5x^2 + 30x}{5} = \frac{20}{5}$$

$$x^2 + 6x = 4$$

↓

$$3^2 = 9$$

$$x^2 + 6x + 9 = 4 + 9$$

$$\sqrt{(x+3)^2} = \sqrt{13}$$

$$x + 3 = \pm \sqrt{13}$$

$$x = \left\{ -3 \pm \sqrt{13} \right\}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 9: Solving Quadratics by
Completing the Square (Day 2)

** This is a 2-page document! **

Solve each quadratic equation by completing the square. Simply all irrational solutions.

1. $3x^2 - 36x + 81 = 0$

$$\frac{3x^2 - 36x}{3} = \frac{-81}{3}$$

$$x^2 - 12x = -27$$

$$\downarrow$$

$$(-6)^2 = 36$$

$$x^2 - 12x + 36 = -27 + 36$$

$$\sqrt{(x-6)^2} = \sqrt{9}$$

$$x-6 = \pm 3$$

$$x = 6 \pm 3$$

$$x = \{3, 9\}$$

2. $8x^2 + 16x - 24 = 0$

$$\frac{8x^2 + 16x}{8} = \frac{24}{8}$$

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

$$\downarrow$$

$$1^2 = 1$$

$$x^2 + 2x + 1 = 3 + 1$$

$$\sqrt{(x+1)^2} = \sqrt{4}$$

$$x+1 = \pm 2$$

$$x = -1 \pm 2$$

$$x = \{-3, 1\}$$

3. $2x^2 - 12x - 65 = 45$

$$\frac{2x^2 - 12x}{2} = \frac{110}{2}$$

$$x^2 - 6x = 55$$

$$\downarrow$$

$$(-3)^2 = 9$$

$$x^2 - 6x + 9 = 55 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{64}$$

$$x-3 = \pm 8$$

$$x = 3 \pm 8$$

$$x = \{-5, 11\}$$

4. $6x^2 + 12x - 15 = 15$

$$\frac{6x^2 + 12x}{6} = \frac{30}{6}$$

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

$$\downarrow$$

$$1^2 = 1$$

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

$$\sqrt{(x+1)^2} = \sqrt{6}$$

$$x+1 = \pm 4$$

$$x = -1 \pm 4$$

$$x = \{-5, 3\}$$

5. $4x^2 + 12x - 14 = 14$

$$\frac{4x^2 + 12x}{4} = \frac{28}{4}$$

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

$$\downarrow$$

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$x^2 + 3x + \frac{9}{4} = 7 + \frac{9}{4}$$

$$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{\frac{25}{4}}$$

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

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

$$x = \left\{-\frac{11}{2}, \frac{1}{2}\right\}$$

6. $8x^2 + 36x + 30 = 10 - x^2$

$$\frac{9x^2 + 36x}{9} = \frac{-20}{9}$$

$$x^2 + 4x = -\frac{20}{9}$$

$$\downarrow$$

$$2^2 = 4$$

$$x^2 + 4x + 4 = -\frac{20}{9} + 4$$

$$\sqrt{(x+2)^2} = \sqrt{\frac{16}{9}}$$

$$x+2 = \pm \frac{4}{3}$$

$$x = -2 \pm \frac{4}{3}$$

$$x = \left\{-\frac{10}{3}, -\frac{2}{3}\right\}$$

$$7. 10x^2 - 20x - 10 = 0$$

$$\frac{10x^2 - 20x}{10} = \frac{10}{10}$$

$$x^2 - 2x = 1$$

$$\downarrow$$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 1 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{2}$$

$$x-1 = \pm \sqrt{2}$$

$$\boxed{x = \{1 \pm \sqrt{2}\}}$$

$$8. 2x^2 - 16x - 50 = 16$$

$$\frac{2x^2 - 16x}{2} = \frac{66}{2}$$

$$x^2 - 8x = 33$$

$$\downarrow$$

$$(-4)^2 = 16$$

$$x^2 - 8x + 16 = 33 + 16$$

$$\sqrt{(x-4)^2} = \sqrt{49}$$

$$x-4 = \pm 7$$

$$x = \{11, -3\}$$

$$\boxed{x = \{-3, 11\}}$$

$$9. 4x^2 + 42x = 2x - 8$$

$$\frac{4x^2 + 40x}{4} = \frac{-8}{4}$$

$$x^2 + 10x = -2$$

$$\downarrow$$

$$5^2 = 25$$

$$x^2 + 10x + 25 = -2 + 25$$

$$\sqrt{(x+5)^2} = \sqrt{23}$$

$$x+5 = \pm \sqrt{23}$$

$$\boxed{x = \{-5 \pm \sqrt{23}\}}$$

$$10. x^2 + 36x + 32 = -16$$

$$x^2 + 36x = -48$$

$$x^2 + 12x = -16$$

$$6^2 = 36$$

$$x^2 + 12x + 36 = -16 + 36$$

$$\sqrt{(x+6)^2} = \sqrt{20}$$

$$x+6 = \pm \sqrt{20}$$

$$\boxed{x = \{-6 \pm 2\sqrt{5}\}}$$

$$11. 2x^2 + 12x - 78 = -2$$

$$\frac{2x^2 + 12x}{2} = \frac{-76}{2}$$

$$x^2 + 6x = -38$$

$$\downarrow$$

$$3^2 = 9$$

$$x^2 + 6x + 9 = -38 + 9$$

$$\sqrt{(x+3)^2} = \sqrt{48}$$

$$x+3 = \pm \sqrt{48}$$

$$\boxed{x = \{-3 \pm 4\sqrt{3}\}}$$

$$12. 5x^2 = 40x + 5$$

$$\frac{5x^2 - 40x}{5} = \frac{5}{5}$$

$$x^2 - 8x = 1$$

$$\downarrow$$

$$(-4)^2 = 16$$

$$x^2 - 8x + 16 = 1 + 16$$

$$\sqrt{(x-4)^2} = \sqrt{17}$$

$$x-4 = \pm \sqrt{17}$$

$$\boxed{x = \{4 \pm \sqrt{17}\}}$$

Name: _____

Algebra I

Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-3: Solving Quadratics by Square Roots and Completing the Square**Solve each equation by square roots. Simplify all irrational solutions.**

1. $x^2 - 81 = 0$

$$\sqrt{x^2} = \sqrt{81}$$

$$x = \pm 9$$

2. $5x^2 + 2 = 7$

$$\frac{5x^2}{5} = \frac{5}{5}$$

$$\sqrt{x^2} = \sqrt{1}$$

$$x = \pm 1$$

3. $\frac{1}{8}x^2 - 9 = -7$

$$8 \cdot \frac{1}{8}x^2 = 2 \cdot 8$$

$$\sqrt{x^2} = \sqrt{16}$$

$$x = \pm 4$$

4. $9x^2 + 17 = 4$

$$\frac{9x^2}{9} = \frac{-13}{9}$$

$$\sqrt{x^2} = \sqrt{\frac{-13}{9}}$$

$$x = \pm \sqrt{\frac{-13}{9}}$$

5. $3x^2 - 11 = 49$

$$\frac{3x^2}{3} = \frac{60}{3}$$

$$\sqrt{x^2} = \sqrt{20}$$

$$x = \pm \sqrt{20}$$

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

6. $8 - 2x^2 = -82$

$$\frac{-2x^2}{-2} = \frac{-90}{-2}$$

$$\sqrt{x^2} = \sqrt{45}$$

$$x = \pm \sqrt{45}$$

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

Factor the perfect square trinomial, then solve the equation by square roots.

7. $x^2 - 26x + 169 = 0$

$$(x-13)^2 = \sqrt{169}$$

$$x-13 = \pm 13$$

$$x = -6 \pm 13$$

$$x = -13, 1$$

8. $x^2 - 2x + 1 = 25$

$$\sqrt{(x-1)^2} = \sqrt{25}$$

$$x-1 = \pm 5$$

$$x = 1 \pm 5$$

$$x = -4, 6$$

1. $x^2 - 16 = 0$

$$x = \pm 4$$

3. $x^2 - 1 = 0$

$$x = \pm 1$$

4. $x = \left\{ -\frac{2}{3}, \frac{2}{3} \right\}$

$$x = \{ -2\sqrt{5}, 2\sqrt{5} \}$$

6. $x = \{ -3\sqrt{5}, 3\sqrt{5} \}$

7. $x = \{ -13, 1 \}$

8. $x = \{ -4, 6 \}$

Solve each equation by completing the square. Simplify all irrational solutions.

9. $x^2 - 4x - 32 = 0$

$$x^2 - 4x = 32$$

$$\downarrow$$

$$(-2)^2 = 4$$

$$x^2 - 4x + 4 = 32 + 4$$

$$\sqrt{(x-2)^2} = \sqrt{36}$$

$$x-2 = \pm 6$$

$$x = 2 \pm 6$$

10. $x^2 + 6x + 13 = 5$

$$x^2 + 6x = -8$$

$$\downarrow$$

$$3^2 = 9$$

$$x^2 + 6x + 9 = -8 + 9$$

$$\sqrt{(x+3)^2} = \sqrt{1}$$

$$x+3 = \pm 1$$

$$x = -3 \pm 1$$

9. $x = \{-4, 8\}$

10. $x = \{-4, 2\}$

11. $x = \{-2 \pm \sqrt{2}\}$

$x = \{-2 \pm 2\sqrt{2}\}$

13. $x = \{10\}$

14. $x = \{-\frac{1}{2}, -\frac{1}{2}\}$

15. $x = \{5 \pm 4\sqrt{2}\}$

16. $x = \{-3 \pm 2\sqrt{6}\}$

11. $x^2 + 14x + 47 = 0$

$$x^2 + 14x = -47$$

$$\downarrow$$

$$7^2 = 49$$

$$x^2 + 14x + 49 = -47 + 49$$

$$\sqrt{(x+7)^2} = \sqrt{2}$$

$$x+7 = \pm \sqrt{2}$$

$$x = -7 \pm \sqrt{2}$$

12. $x^2 = 20x - 92$

$$x^2 - 20x = -92$$

$$\downarrow$$

$$(-10)^2 = 100$$

$$x^2 - 20x + 100 = -92 + 100$$

$$\sqrt{(x-10)^2} = \sqrt{8}$$

$$x-10 = \pm \sqrt{8}$$

$$x = 10 \pm 2\sqrt{2}$$

13. $3x^2 - 24x = 60$

$$x^2 - 8x = 20$$

$$\downarrow$$

$$(-4)^2 = 16$$

$$x^2 - 8x + 16 = 20 + 16$$

$$\sqrt{(x-4)^2} = \sqrt{36}$$

$$x-4 = \pm 6$$

$$x = 4 \pm 6$$

14. $8x^2 + 16x = -6$

$$8x^2 + 16x = -6$$

$$\downarrow$$

$$x^2 + 2x = -\frac{3}{4}$$

$$1^2 = 1$$

$$x^2 + 2x + 1 = -\frac{3}{4} + 1$$

$$\sqrt{(x+1)^2} = \sqrt{\frac{1}{4}}$$

$$x+1 = \pm \frac{1}{2}$$

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

15. $5x^2 - 10x - 35 = 0$

$$5x^2 - 10x = 35$$

$$x^2 - 2x = 7$$

$$\downarrow$$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 7 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{8}$$

$$x-1 = \pm \sqrt{8}$$

$$x = 1 \pm 2\sqrt{2}$$

16. $3x^2 + 12x = x^2 + 30$

$$2x^2 + 12x = 30$$

$$x^2 + 6x = 15$$

$$\downarrow$$

$$3^2 = 9$$

$$x^2 + 6x + 9 = 15 + 9$$

$$\sqrt{(x+3)^2} = \sqrt{24}$$

$$x+3 = \pm \sqrt{24}$$

$$x = -3 \pm 2\sqrt{6}$$

Name: _____		Date: _____	
Topic: _____		Class: _____	

Main Ideas/Questions	Notes/Examples								
THE QUADRATIC FORMULA $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	The quadratic formula is another method to use to solve a quadratic equation. Solve the equation below using the quadratic formula. <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Steps</th> <th style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Example</th> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;"> 1 Make sure the equation is set equal to 0 and written in standard form. </td> <td style="padding: 5px;"> $x^2 - 5x - 3 = 0$ $x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-3)}}{2(1)}$ </td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;"> 2 Identify a, b, and c. </td> <td style="padding: 5px;"> $a = 1, b = -5, c = -3$ $x = \frac{5 \pm \sqrt{25 + 12}}{2}$ </td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;"> 3 Substitute these values into the formula and SIMPLIFY! </td> <td style="padding: 5px;"> $x = \frac{5 \pm \sqrt{37}}{2} = \frac{5 \pm \sqrt{37}}{2} \rightarrow \left\{ \frac{5 + \sqrt{37}}{2}, \frac{5 - \sqrt{37}}{2} \right\}$ </td> </tr> </table>	Steps	Example	1 Make sure the equation is set equal to 0 and written in standard form .	$x^2 - 5x - 3 = 0$ $x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-3)}}{2(1)}$	2 Identify a , b , and c .	$a = 1, b = -5, c = -3$ $x = \frac{5 \pm \sqrt{25 + 12}}{2}$	3 Substitute these values into the formula and SIMPLIFY!	$x = \frac{5 \pm \sqrt{37}}{2} = \frac{5 \pm \sqrt{37}}{2} \rightarrow \left\{ \frac{5 + \sqrt{37}}{2}, \frac{5 - \sqrt{37}}{2} \right\}$
Steps	Example								
1 Make sure the equation is set equal to 0 and written in standard form .	$x^2 - 5x - 3 = 0$ $x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-3)}}{2(1)}$								
2 Identify a , b , and c .	$a = 1, b = -5, c = -3$ $x = \frac{5 \pm \sqrt{25 + 12}}{2}$								
3 Substitute these values into the formula and SIMPLIFY!	$x = \frac{5 \pm \sqrt{37}}{2} = \frac{5 \pm \sqrt{37}}{2} \rightarrow \left\{ \frac{5 + \sqrt{37}}{2}, \frac{5 - \sqrt{37}}{2} \right\}$								
YOU TRY!	Directions: Solve each equation using the quadratic formula. 1. $x^2 - 8x = 20$ $x^2 - 8x - 20 = 0$ $x = \frac{8 \pm \sqrt{(-8)^2 - 4(1)(-20)}}{2(1)}$ $x = \frac{8 \pm \sqrt{64 + 80}}{2}$ $x = \frac{8 \pm \sqrt{144}}{2} = \frac{8 \pm 12}{2} = \left\{ -2, 10 \right\}$ 2. $2x^2 + 7x + 3 = 12$ $2x^2 + 7x - 9 = 0$ $x = \frac{-7 \pm \sqrt{7^2 - 4(2)(-9)}}{2(2)}$ $x = \frac{-7 \pm \sqrt{49 + 72}}{4}$ $x = \frac{-7 \pm \sqrt{121}}{4} = \frac{-7 \pm 11}{4} = \left\{ \frac{-9}{2}, 1 \right\}$ 3. $3x^2 + 12x + 12 = 0$ $x = \frac{-12 \pm \sqrt{12^2 - 4(3)(12)}}{2(3)}$ $x = \frac{-12 \pm \sqrt{144 - 144}}{6}$ $x = \frac{-12 \pm \sqrt{0}}{6} = \frac{-12 \pm 0}{6} = \left\{ -2 \right\}$ 4. $x^2 + 15x = 6x$ $x^2 + 9x = 0$ $x = \frac{-9 \pm \sqrt{9^2 - 4(1)(0)}}{2(1)}$ $x = \frac{-9 \pm \sqrt{81 + 0}}{2}$ $x = \frac{-9 \pm 9}{2} = \left\{ -9, 0 \right\}$ 5. $-x^2 - 10x - 21 = 0$ $x = \frac{10 \pm \sqrt{(-10)^2 - 4(-1)(-21)}}{2(-1)}$ $x = \frac{10 \pm \sqrt{100 - 84}}{-2}$ $x = \frac{10 \pm \sqrt{16}}{-2} = \frac{10 \pm 4}{-2} = \left\{ -7, -3 \right\}$ 6. $4x^2 + 9x = 12x$ $4x^2 - 3x = 0$ $x = \frac{3 \pm \sqrt{(-3)^2 - 4(4)(0)}}{2(4)}$ $x = \frac{3 \pm \sqrt{9 + 0}}{8}$ $x = \frac{3 \pm 3}{8} = \left\{ 0, \frac{3}{4} \right\}$								

IRRATIONAL SOLUTIONS

$$7. \begin{aligned} x^2 + 7x &= x - 10 \\ x^2 + 6x + 10 &= 0 \\ x &= \frac{-6 \pm \sqrt{6^2 - 4(1)(10)}}{2(1)} \end{aligned}$$

$$x = \frac{-6 \pm \sqrt{36 - 40}}{2}$$

$$x = \frac{-6 \pm \sqrt{-4}}{2} = \boxed{\emptyset}$$

$$8. \begin{aligned} 3x^2 - 5x &= 4 - 3x^2 \\ 6x^2 - 5x - 4 &= 0 \\ x &= \frac{5 \pm \sqrt{(-5)^2 - 4(6)(-4)}}{2(6)} \end{aligned}$$

$$x = \frac{5 \pm \sqrt{25 + 96}}{12}$$

$$x = \frac{5 \pm \sqrt{121}}{12}$$

Directions: Solve each equation using the quadratic formula. Write all irrational solutions in simplest radical form.

$$9. \begin{aligned} x^2 + 4x + 1 &= 0 \\ x &= \frac{-4 \pm \sqrt{4^2 - 4(1)(1)}}{2(1)} \end{aligned}$$

$$x = \frac{-4 \pm \sqrt{16 - 4}}{2}$$

$$x = \frac{-4 \pm \sqrt{12}}{2}$$

$$x = \frac{-4 \pm 2\sqrt{3}}{2} = \boxed{\{-2 \pm \sqrt{3}\}}$$

$$10. \begin{aligned} -x^2 - 2x + 7 &= 0 \\ x^2 + 2x - 7 &= 0 \\ x &= \frac{-2 \pm \sqrt{2^2 - 4(1)(-7)}}{2(1)} \end{aligned}$$

$$x = \frac{-2 \pm \sqrt{4 + 28}}{2}$$

$$x = \frac{-2 \pm \sqrt{32}}{-2}$$

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

$$11. \begin{aligned} x^2 + 9 &= 20 \\ x^2 + x - 11 &= 0 \\ x &= \frac{-1 \pm \sqrt{1^2 - 4(1)(-11)}}{2(1)} \end{aligned}$$

$$x = \frac{-1 \pm \sqrt{45}}{2}$$

$$x = \frac{-1 \pm 3\sqrt{5}}{2} = \boxed{\left\{ \frac{-1 \pm 3\sqrt{5}}{2} \right\}}$$

$$12. \begin{aligned} 4x^2 - 7x &= -2 \\ 4x^2 - 7x + 2 &= 0 \\ x &= \frac{7 \pm \sqrt{(-7)^2 - 4(4)(2)}}{2(4)} \end{aligned}$$

$$x = \frac{7 \pm \sqrt{49 - 32}}{8}$$

$$x = \left\{ \frac{7 \pm \sqrt{17}}{8} \right\}$$

$$13. \begin{aligned} x^2 + 3 &= 8x - x^2 \\ 2x^2 - 8x + 3 &= 0 \\ x &= \frac{8 \pm \sqrt{(-8)^2 - 4(2)(3)}}{2(2)} \end{aligned}$$

$$x = \frac{8 \pm \sqrt{64 - 24}}{4}$$

$$x = \frac{8 \pm \sqrt{40}}{4} = \frac{8 \pm 2\sqrt{10}}{4} = \boxed{\left\{ \frac{4 \pm \sqrt{10}}{2} \right\}}$$

$$14. \begin{aligned} 3x^2 - 6x &= 12 \\ 3x^2 - 6x - 12 &= 0 \\ x &= \frac{6 \pm \sqrt{(-6)^2 - 4(3)(-12)}}{2(3)} \end{aligned}$$

$$x = \frac{6 \pm \sqrt{36 + 144}}{6}$$

$$x = \frac{6 \pm \sqrt{180}}{6}$$

$$x = \frac{6 \pm 6\sqrt{5}}{6} = \boxed{\{1 \pm \sqrt{5}\}}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 10: Solving Quadratics by
The Quadratic Formula

** This is a 2-page document! **

Solve each quadratic equation by the quadratic formula.
Simplify all irrational solutions.

1. $x^2 - 2x - 48 = 0$

$$X = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-48)}}{2(1)}$$

$$X = \frac{2 \pm \sqrt{4 + 192}}{2}$$

$$X = \frac{2 \pm \sqrt{196}}{2}$$

$$X = \frac{2 \pm 14}{2} = \boxed{\{-6, 8\}}$$

2. $6x^2 - 15x = 0$

$$X = \frac{15 \pm \sqrt{(-15)^2 - 4(6)(0)}}{2(6)}$$

$$X = \frac{15 \pm \sqrt{225}}{12}$$

$$X = \frac{15 \pm 15}{12}$$

$$X = \frac{0}{12}$$

$$X = \boxed{\left\{\frac{5}{2}, 0\right\}}$$

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

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

$$X = \frac{-8 \pm \sqrt{8^2 - 4(-1)(-7)}}{2(-1)}$$

$$X = \frac{-8 \pm \sqrt{64 - 28}}{-2}$$

$$X = \frac{-8 \pm \sqrt{36}}{-2}$$

$$X = \frac{-8 \pm 6}{-2}$$

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

$$x^2 + 6x + 6 = 0$$

$$X = \frac{-6 \pm \sqrt{6^2 - 4(1)(6)}}{2(1)}$$

$$X = \frac{-6 \pm \sqrt{36 - 24}}{2}$$

$$X = \frac{-6 \pm \sqrt{12}}{2}$$

$$X = \frac{-6}{2} = \boxed{\{-3\}}$$

5. $x^2 - 10x + 25 = 0$

$$X = \frac{10 \pm \sqrt{10^2 - 4(1)(25)}}{2(1)}$$

$$X = \frac{10 \pm \sqrt{100 - 100}}{2}$$

$$X = \frac{10 \pm 0}{2}$$

$$X = \frac{10}{2} = \boxed{\left\{\frac{5}{2}\right\}}$$

6. $6x^2 + 18x = x - 12$

$$6x^2 + 17x + 12 = 0$$

$$X = \frac{-17 \pm \sqrt{17^2 - 4(6)(12)}}{2(6)}$$

$$X = \frac{-17 \pm \sqrt{289 - 288}}{12}$$

$$X = \frac{-17 \pm \sqrt{1}}{12}$$

$$X = \frac{-17 \pm 1}{12} = \boxed{\left\{-\frac{3}{2}, -\frac{4}{3}\right\}}$$

$$7. \quad x^2 + 2x = 3 - 2x$$

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

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(-3)}}{2(1)}$$

$$x = \frac{-4 \pm \sqrt{16 + 12}}{2}$$

$$x = \frac{-4 \pm \sqrt{28}}{2}$$

$$x = \frac{-4 \pm 2\sqrt{7}}{2} = \boxed{\{-2 \pm \sqrt{7}\}}$$

$$8. \quad -x^2 + 7x - 18 = 0$$

$$x = \frac{-7 \pm \sqrt{7^2 - 4(-1)(-18)}}{2(-1)}$$

$$x = \frac{-7 \pm \sqrt{49 - 72}}{-2}$$

$$x = \frac{-7 \pm \sqrt{-23}}{-2}$$

$$x = \frac{-7 \pm i\sqrt{23}}{-2}$$

$$9. \quad 2x^2 - 8x - 2 = 3$$

$$2x^2 - 8x - 5 = 0$$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{8 \pm \sqrt{64 + 40}}{4}$$

$$x = \frac{8 \pm \sqrt{104}}{4}$$

$$x = \frac{8 \pm 2\sqrt{26}}{4} = \boxed{\{2 \pm \sqrt{26}\}}$$

$$10. \quad x^2 - 19x - 120 = 0$$

$$x^2 - 24x + 5 = 0$$

$$x = \frac{24 \pm \sqrt{0^2 - 4(10)(-24)}}{2(10)}$$

$$x = \frac{24 \pm \sqrt{0 + 960}}{20}$$

$$x = \frac{\pm \sqrt{960}}{20}$$

$$x = \frac{\pm 8\sqrt{15}}{20} = \boxed{\left\{ \pm \frac{2\sqrt{15}}{5} \right\}}$$

$$11. \quad 4x^2 - 6x - 8 = 0$$

$$4x^2 - 6x - 8 = 0$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(4)(-8)}}{2(4)}$$

$$x = \frac{6 \pm \sqrt{36 + 128}}{8}$$

$$x = \frac{6 \pm \sqrt{164}}{8}$$

$$x = \frac{6 \pm 2\sqrt{41}}{8} = \boxed{\left\{ \frac{3 \pm \sqrt{41}}{4} \right\}}$$

$$12. \quad 2x^2 + 12x = 4 - x^2$$

$$3x^2 + 12x - 4 = 0$$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(3)(-4)}}{2(3)}$$

$$x = \frac{-12 \pm \sqrt{144 + 48}}{6}$$

$$x = \frac{-12 \pm \sqrt{192}}{6}$$

$$x = \frac{-12 \pm 8\sqrt{3}}{6} = \boxed{\left\{ \frac{-6 \pm 4\sqrt{3}}{3} \right\}}$$

● ● ● SOLVING QUADRATICS REVIEW ● ● ●

METHOD 1: FACTORING

1. $x^2 - 6x - 40 = 0$

$$\begin{array}{l|l} (x-10)(x+4) = 0 & \\ \hline x-10=0 & x+4=0 \\ x=10 & x=-4 \end{array}$$

$$x = \{-4, 10\}$$

2. $x^2 - 14x + 49 = 0$

$$\begin{array}{l|l} (x-7)(x-7) = 0 & \\ \hline x-7=0 & x-7=0 \\ x=7 & x=7 \end{array}$$

$$x = \{7\}$$

3. $10x^2 - 25 = x^2$

$$9x^2 - 25 = 0$$

$$\begin{array}{l|l} (3x+5)(3x-5) = 0 & \\ \hline 3x+5=0 & 3x-5=0 \\ x=-\frac{5}{3} & x=\frac{5}{3} \end{array}$$

$$x = \left\{-\frac{5}{3}, \frac{5}{3}\right\}$$

4. $12x^2 + 8x = 0$

$$\begin{array}{l|l} 4x(3x+2) = 0 & \\ \hline 4x=0 & 3x+2=0 \\ x=0 & x=-\frac{2}{3} \end{array}$$

$$x = \left\{-\frac{2}{3}, 0\right\}$$

5. $2x^2 + 80 = 26x$

$$2x^2 - 26x + 80 = 0$$

$$2(x^2 - 13x + 40) = 0$$

$$\begin{array}{l|l|l} 2(x-8)(x-5) = 0 & & \\ \hline 2 \neq 0 & x-8=0 & x-5=0 \\ & x=8 & x=5 \end{array}$$

$$x = \{5, 8\}$$

6. $4x^2 + 5x + 1 = 0$

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

$$(x+4)(x+1) = 0$$

$$\begin{array}{l|l} (x+1)(4x+1) = 0 & \\ \hline x+1=0 & 4x+1=0 \\ x=-1 & x=-\frac{1}{4} \end{array}$$

$$x = \left\{-1, -\frac{1}{4}\right\}$$

METHOD 2: QUADRATIC FORMULA

7. $x^2 = 225$

$$x = \{-15, 15\}$$

8. $4x^2 - 1 = 48$

$$\frac{4x^2}{4} = \frac{49}{4}$$

$$\sqrt{x^2} = \sqrt{\frac{49}{4}}$$

$$x = \pm \frac{7}{2}$$

$$x = \left\{-\frac{7}{2}, \frac{7}{2}\right\}$$

9. $x^2 = 98$

$$\sqrt{x^2} = \sqrt{98}$$

$$x = \pm \sqrt{98}$$

$$x = \pm 7\sqrt{2}$$

$$x = \{7\sqrt{2}, -7\sqrt{2}\}$$

10. $\frac{3}{4}x^2 + 1 = 31$

$$\frac{4}{3} \cdot \frac{3}{4}x^2 = 30 \cdot \frac{4}{3}$$

$$\sqrt{x^2} = \sqrt{40}$$

$$x = \pm \sqrt{40}$$

$$x = \{2\sqrt{10}, -2\sqrt{10}\}$$

METHOD 3: COMPLETING THE SQUARE

11. $x^2 - 18x + 65 = 0$

$$x^2 - 18x = -65$$

$$\downarrow$$

$$(-9)^2 = 81$$

$$x^2 - 18x + 81 = -65 + 81$$

$$\sqrt{(x-9)^2} = \sqrt{16}$$

$$x-9 = \pm 4$$

$$x = 9 \pm 4$$

$$x = \{5, 13\}$$

12. $x^2 + 16x + 55 = 3$

$$x^2 + 16x = -52$$

$$\downarrow$$

$$8^2 = 64$$

$$x^2 + 16x + 64 = -52 + 64$$

$$\sqrt{(x+8)^2} = \sqrt{12}$$

$$x+8 = \pm 2\sqrt{3}$$

$$x = \{-8 \pm 2\sqrt{3}\}$$

13. $2x^2 + 9x = x - 14$

$$2x^2 + 8x = -14$$

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

$$\downarrow$$

$$2^2 = 4$$

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

$$\sqrt{(x+2)^2} = \sqrt{-3}$$

$$x = \emptyset$$

14. $9x^2 = 18x + 40$

$$9x^2 - 18x = 40$$

$$\downarrow$$

$$(-1)^2 = 1$$

$$9x^2 - 18x + 9 = 40 + 9$$

$$\sqrt{(3x-3)^2} = \sqrt{49}$$

$$3x-3 = \pm 7$$

$$x = \left\{\frac{4}{3}, \frac{10}{3}\right\}$$

METHOD 4: QUADRATIC FORMULA

15. $x^2 + 12x - 24 = 0$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(1)(-24)}}{2(1)}$$

$$x = \frac{-12 \pm \sqrt{144 + 96}}{2}$$

$$x = \frac{-12 \pm \sqrt{240}}{2} = \{-6 \pm 2\sqrt{15}\}$$

16. $x^2 - 3x + 9 = 0$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(1)(9)}}{2(-1)}$$

$$x = \frac{3 \pm \sqrt{9 - 36}}{-2}$$

$$x = \frac{3 \pm \sqrt{-27}}{-2}$$

$$x = \frac{3 \pm 3\sqrt{-3}}{-2} = \left\{\frac{3 \pm 3\sqrt{-3}}{-2}\right\}$$

17. $-x^2 + 12x - 9 = 0$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(-1)(-9)}}{2(-1)}$$

$$x = \frac{-12 \pm \sqrt{144 - 36}}{-2}$$

$$x = \frac{-12 \pm \sqrt{108}}{-2}$$

$$x = \emptyset$$

18. $3x^2 - 9x = x - 5$

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

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(3)(5)}}{2(3)}$$

$$x = \frac{10 \pm \sqrt{100 - 60}}{6}$$

$$x = \frac{10 \pm \sqrt{40}}{6} = \frac{10 \pm 2\sqrt{10}}{6} = \left\{\frac{5 \pm \sqrt{10}}{3}\right\}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 11: Solving Quadratics Review

**** This is a 2-page document! ******Solve each equation by factoring.**

1. $x^2 + x - 42 = 0$

$(x+7)(x-6) = 0$

$x+7=0 \quad x-6=0$

$x=-7 \quad x=6$

$x = \{-7, 6\}$

2. $4x^2 + 24x + 36 = 0$

$4(x^2 + 6x + 9) = 0$

$4(x+3)(x+3) = 0$

$4 \neq 0 \quad x+3=0 \quad x+3=0$

$x=-3 \quad x=-3$

$x = \{-3, -3\}$

3. $14x^2 + 6x = 2x$

$14x^2 + 4x = 0$

$2x(7x+2) = 0$

$2x=0 \quad 7x+2=0$

$x=0 \quad x=-\frac{2}{7}$

$x = \{0, -\frac{2}{7}\}$

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

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

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

$x+1=0 \quad x-1=0$

$x=-1 \quad x=1$

$x = \{-1, 1\}$

5. $3x^2 + 23x - 8 = 0$

$x^2 + 23x - 24 = 0$

$(x+24)(x-1) = 0$

$(x+8)(3x-1) = 0$

$x+8=0 \quad 3x-1=0$

$x=-8 \quad x=\frac{1}{3}$

$x = \{-8, \frac{1}{3}\}$

$x^2 = 3 + 2x$

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

$(x-3)(x+1) = 0$

$x-3=0 \quad x+1=0$

$x=3 \quad x=-1$

$(4x-3)(2x+1) = 0$

$4x-3=0 \quad 2x+1=0$

$x=\frac{3}{4} \quad x=-\frac{1}{2}$

$x = \{\frac{3}{4}, -\frac{1}{2}\}$

Solve each equation by taking square roots.

7. $x^2 + 4 = 25$

$x^2 = 21$

$x = \pm\sqrt{21}$

$x = \{\pm\sqrt{21}\}$

8. $9x^2 - 1 = 0$

$9x^2 = 1$

$\sqrt{9x^2} = \sqrt{1}$

$x = \pm\frac{1}{3}$

$x = \{\pm\frac{1}{3}\}$

9. $27x^2 = 53$

$-27x^2 = -53$

$-27x^2 = -53$

$\sqrt{x^2} = \sqrt{\frac{53}{27}}$

$x = \pm\sqrt{\frac{53}{27}}$

$x = \pm\sqrt{\frac{53}{27}}$

$x = \{\pm\sqrt{\frac{53}{27}}\}$

10. $\frac{2}{3}x - 16 = 32$

$\frac{2}{3}x = 48$

$\sqrt{x^2} = \sqrt{72}$

$x = \pm\sqrt{72}$

$x = \pm\sqrt{72}$

$x = \{\pm\sqrt{72}\}$

Solve each equation by completing the square.

11. $x^2 + 8x - 33 = 0$

$$x^2 + 8x = 33$$

$$\downarrow$$

$$4^2 = 16$$

$$x^2 + 8x + 16 = 33 + 16$$

$$\sqrt{(x+4)^2} = \sqrt{49}$$

$$x+4 = \pm 7$$

$$x = -4 \pm 7$$

$$x = \{-11, 3\}$$

12. $x^2 - 57 = 2x + 5$

$$x^2 - 2x = 62$$

$$\downarrow$$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 62 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{63}$$

$$x-1 = \pm \sqrt{63}$$

$$x-1 = \pm 3\sqrt{7}$$

$$x = 1 \pm 3\sqrt{7}$$

13. $-x^2 + 15x = 73 - 3x$

$$-x^2 + 18x = 73$$

$$x^2 - 18x = -73$$

$$\downarrow$$

$$(-9)^2 = 81$$

$$x^2 - 18x + 81 = -73 + 81$$

$$\sqrt{(x-9)^2} = \sqrt{8}$$

$$x-9 = \pm \sqrt{8}$$

$$x = \{9 \pm 2\sqrt{2}\}$$

14. $x^2 + 8x - 1 = \frac{45}{4}$

$$x^2 + 8x = \frac{45}{4} + 1$$

$$\downarrow$$

$$\left(\frac{4}{2}\right)^2 = \frac{16}{4}$$

$$x^2 + 8x + 16 = \frac{45}{4} + \frac{16}{4}$$

$$\sqrt{(x+4)^2} = \sqrt{\frac{61}{4}}$$

$$x+4 = \pm \frac{\sqrt{61}}{2}$$

$$x = -4 \pm \frac{\sqrt{61}}{2}$$

$$x = \{-4 \pm \frac{\sqrt{61}}{2}\}$$

Solve each equation using the quadratic formula.

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

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

$$2(-1)$$

$$\sqrt{36 - 8}$$

$$-2$$

$$x = \frac{-6 \pm \sqrt{28}}{-2}$$

$$x = \frac{-6 \pm 2\sqrt{7}}{-2}$$

$$x = \{3 \pm \sqrt{7}\}$$

16. $8x^2 - 3 = 8x + 10$

$$8x^2 - 8x - 13 = 0$$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(8)(-13)}}{2(8)}$$

$$x = \frac{8 \pm \sqrt{64 + 416}}{16}$$

$$x = \frac{8 \pm \sqrt{480}}{16}$$

$$x = \frac{8 \pm 4\sqrt{30}}{16}$$

$$x = \left\{ \frac{2 \pm \sqrt{30}}{4} \right\}$$

SOLVING QUADRATIC EQUATIONS: Methods Comparison

FACTORING	COMPLETING THE SQUARE	QUADRATIC FORMULA				
1 $x^2 - 14x + 48 = 0$ $(x-8)(x-6) = 0$ <table><tr><td>$x-8=0$</td><td>$x-6=0$</td></tr><tr><td>$x=8$</td><td>$x=6$</td></tr></table> $x = \{6, 8\}$	$x-8=0$	$x-6=0$	$x=8$	$x=6$	$x^2 - 14x = -48$ $(-7)^2 = 49$ $x^2 - 14x + 49 = -48 + 49$ $\sqrt{(x-7)^2} = \sqrt{1}$ $x-7 = \pm 1$ $x = 7 \pm 1$ $x = \{6, 8\}$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{14 \pm \sqrt{196 - 192}}{2}$ $x = \{6, 8\}$
$x-8=0$	$x-6=0$					
$x=8$	$x=6$					
2 $x^2 + 19 = 4 - 8x$ $x^2 + 8x + 15 = 0$ $(x+3)(x+5) = 0$ <table><tr><td>$x+3=0$</td><td>$x+5=0$</td></tr><tr><td>$x=-3$</td><td>$x=-5$</td></tr></table> $x = \{-5, -3\}$	$x+3=0$	$x+5=0$	$x=-3$	$x=-5$	$x^2 + 8x = -15$ $4^2 = 16$ $x^2 + 8x + 16 = -15 + 16$ $\sqrt{(x+4)^2} = \sqrt{1}$ $x+4 = \pm 1$ $x = -4 \pm 1$ $x = \{-5, -3\}$	$x = \frac{-8 \pm \sqrt{8^2 - 4(1)(15)}}{2(1)}$ $x = \frac{-8 \pm \sqrt{64 - 60}}{2}$ $x = \frac{-8 \pm \sqrt{4}}{2}$ $x = \{-5, -3\}$
$x+3=0$	$x+5=0$					
$x=-3$	$x=-5$					
3 $2x^2 + 4x = 48$ $2x^2 + 4x - 48 = 0$ $2(x^2 + 2x - 24) = 0$ $2(x+6)(x-4) = 0$ <table><tr><td>$x+6=0$</td><td>$x-4=0$</td></tr><tr><td>$x=-6$</td><td>$x=4$</td></tr></table> $x = \{-6, 4\}$	$x+6=0$	$x-4=0$	$x=-6$	$x=4$	$2x^2 + 4x = 48$ $x^2 + 2x = 24$ $1^2 = 1$ $x^2 + 2x + 1 = 24 + 1$ $\sqrt{(x+1)^2} = \sqrt{25}$ $x+1 = \pm 5$ $x = -1 \pm 5$ $x = \{-6, 4\}$	$x = \frac{-4 \pm \sqrt{4^2 - 4(2)(-48)}}{2(2)}$ $x = \frac{-4 \pm \sqrt{16 + 384}}{4}$ $x = \frac{-4 \pm \sqrt{400}}{4}$ $x = \{-6, 4\}$
$x+6=0$	$x-4=0$					
$x=-6$	$x=4$					

FACTORING	COMPLETING THE SQUARE	THE QUADRATIC FORMULA
4 $-x^2 - 6x + 16 = 0$ $x^2 - 6x - 16 = 0$ $(x - 8)(x + 2) = 0$ $\begin{array}{c c} x - 8 = 0 & x + 2 = 0 \\ x = -8 & x = 2 \end{array}$ $x = \{-8, 2\}$	$-x^2 - 6x = -16$ $x^2 + 6x = 16$ $\downarrow$ $3^2 = 9$ $x^2 + 6x + 9 = 16 + 9$ $\sqrt{(x+3)^2} = \sqrt{25}$ $x+3 = \pm 5$ $x = -3 \pm 5$ $x = \{-8, 2\}$	$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(-1)(16)}}{2(-1)}$ $x = \frac{6 \pm \sqrt{36 + 64}}{-2}$ $x = \frac{6 \pm 10}{-2}$ $x = \{-8, 2\}$
5 $9x^2 - 18x = 7$ $9x^2 - 18x - 7 = 0$ $x^2 - 2x - \frac{7}{9} = 0$ $(x - \frac{2}{9})(x + \frac{7}{9}) = 0$ $\begin{array}{c c} 3x - 7 = 0 & 3x + 1 = 0 \\ x = \frac{7}{3} & x = -\frac{1}{3} \end{array}$ $x = \{-\frac{1}{3}, \frac{7}{3}\}$	$9x^2 - 18x = 7$ $x^2 - 2x = \frac{7}{9}$ $\downarrow$ $1^2 = 1$ $x^2 - 2x + 1 = \frac{7}{9} + 1$ $\sqrt{(x-1)^2} = \sqrt{\frac{16}{9}}$ $x-1 = \pm \frac{4}{3}$ $x = 1 \pm \frac{4}{3}$ $x = \{-\frac{1}{3}, \frac{7}{3}\}$	$x = \frac{18 \pm \sqrt{(-18)^2 - 4(9)(-7)}}{2(9)}$ $x = \frac{18 \pm \sqrt{324 + 252}}{18}$ $x = \frac{18 \pm \sqrt{576}}{18}$ $x = \frac{18 \pm 24}{18}$ $x = \{-\frac{1}{3}, \frac{7}{3}\}$
6 $3x^2 + 16x - 64 = 1 - x^2$ $4x^2 + 16x - 65 = 0$ $x^2 + 4x - \frac{65}{4} = 0$ $(x + \frac{13}{2})(x - \frac{5}{2}) = 0$ $\begin{array}{c c} 2x + 13 = 0 & 2x - 5 = 0 \\ x = -\frac{13}{2} & x = \frac{5}{2} \end{array}$ $x = \{-\frac{13}{2}, \frac{5}{2}\}$	$4x^2 + 16x = 65$ $x^2 + 4x = \frac{65}{4}$ $\downarrow$ $2^2 = 4$ $x^2 + 4x + 4 = \frac{65}{4} + 4$ $\sqrt{(x+2)^2} = \sqrt{\frac{81}{4}}$ $x+2 = \pm \frac{9}{2}$ $x = -2 \pm \frac{9}{2}$ $x = \{-\frac{13}{2}, \frac{5}{2}\}$	$x = \frac{-16 \pm \sqrt{16^2 - 4(4)(-65)}}{2(4)}$ $x = \frac{-16 \pm \sqrt{256 + 1040}}{8}$ $x = \frac{-16 \pm \sqrt{1296}}{8}$ $x = \frac{-16 \pm 36}{8}$ $x = \{-\frac{13}{2}, \frac{5}{2}\}$

Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples					
Choosing the BEST METHOD	METHOD	BEST USED WHEN				
	FACTORING	The equation is factorable.				
	SQUARE ROOTS	There is no "bx" term.				
	COMPLETING THE SQUARE	a=1 and b is even.				
	QUADRATIC FORMULA	All other cases!				
When is it FACTORABLE?	The equation is factorable if its discriminant ($d=b^2-4ac$) is a perfect square.					
EXAMPLES (HINT: Use the discriminant to determine if its factorable!)	Directions: Choose a method and solve each equation below. You can only use each method once.					
	1. $x^2 - 6x + 7 = 73$ $x^2 - 6x = 66$ $(-3)^2 = 9$ $-6x + 9 = 66 + 9$ $-6x = 75$ $x = \frac{75}{-6}$ $x - 3 = 5\sqrt{3}$ $x = \{3 \pm 5\sqrt{3}\}$	☐ F ☐ SR ☒ CS ☐ QF $-4 = 0$ $9x^2 = 4$ $\frac{9}{9} \quad \frac{4}{9}$ $\sqrt{x^2} = \sqrt{\frac{4}{9}}$ $x = \pm \frac{2}{3}$ $x = \{-\frac{2}{3}, \frac{2}{3}\}$				
	3. $2x^2 + 8x + 10 = 3$ $2x^2 + 8x + 7 = 0$ $x = \frac{-8 \pm \sqrt{8^2 - 4(2)(7)}}{2(2)}$ $x = \frac{-8 \pm \sqrt{64 - 56}}{4}$ $x = \frac{-8 \pm \sqrt{8}}{4}$ $x = \frac{-8 \pm 2\sqrt{2}}{4} = \{-4 \pm \sqrt{2}\}$	☐ F ☐ SR ☐ CS ☒ QF 4. $x^2 + 9x + 14 = 0$ $(x+7)(x+2) = 0$ <table><tr><td>$x+7=0$</td><td>$x+2=0$</td></tr><tr><td>$x=-7$</td><td>$x=-2$</td></tr></table> $x = \{-7, -2\}$ ☒ F ☐ SR ☐ CS ☐ QF	$x+7=0$	$x+2=0$	$x=-7$	$x=-2$
$x+7=0$	$x+2=0$					
$x=-7$	$x=-2$					

Directions: Solve each equation below using your method of choice. Simplify all irrational solutions.

5. $x^2 - 2x = 4$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 4 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{5}$$

$$x-1 = \pm\sqrt{5}$$

$$x = \{1 \pm \sqrt{5}\}$$

6. $10x^2 + x - 2 = 0$

$$d = 1^2 - 4(10)(-2) = 81$$

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

$$\frac{(x+5)(x-4)}{10} = 0$$

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

$$2x+1=0 \quad 5x-2=0$$

$$x = -\frac{1}{2} \quad x = \frac{2}{5}$$

$$x = \{-\frac{1}{2}, \frac{2}{5}\}$$

7. $5x^2 - 15x - 50 = 0$

$$d = (-15)^2 - 4(5)(-50) = 1225$$

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

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

$$5 \neq 0 \quad x-5=0 \quad x+2=0$$

$$x = \{-2, 5\}$$

8. $36x^2 = 9x$

$$36x^2 - 9x = 0$$

$$9x(4x-1) = 0$$

$$9 \neq 0 \quad 4x-1=0$$

$$x = \frac{1}{4}$$

$$x = \{0, \frac{1}{4}\}$$

9. $-x^2 + 16x - 63 = 0$

$$x^2 - 16x + 63 = 0$$

$$\frac{(x+9)(x+7)}{-1 \quad -1} = 0$$

$$\frac{(x-9)(x-7)}{1 \quad 1} = 0$$

$$x-9=0 \quad x-7=0$$

$$x=9 \quad x=7$$

$$x = \{7, 9\}$$

10. $x^2 + 10x = 4 \rightarrow x^2 + 10x - 4 = 0$

$$x = \frac{-10 \pm \sqrt{10^2 - 4(1)(-4)}}{2(1)}$$

$$x = \frac{-10 \pm \sqrt{100 + 16}}{2}$$

$$x = \frac{-10 \pm \sqrt{116}}{2}$$

$$x = \frac{-10 \pm 2\sqrt{29}}{2}$$

$$x = \{-5 \pm \sqrt{29}\}$$

11. $6x^2 - 16x - 32 = 0$

$$\frac{6x^2 - 16x - 32}{6} = 0$$

$$\sqrt{128}$$

$$x = \pm\sqrt{8}$$

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

$$x = \{-2\sqrt{2}, 2\sqrt{2}\}$$

12. $4x^2 = 4x + 7 \rightarrow 4x^2 - 4x - 7 = 0$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(4)(-7)}}{2(4)}$$

$$x = \frac{4 \pm \sqrt{16 + 112}}{8}$$

$$x = \frac{4 \pm \sqrt{128}}{8}$$

$$x = \frac{4 \pm 8\sqrt{2}}{8}$$

$$x = \{\frac{1 \pm 2\sqrt{2}}{2}\}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 12: Solving Quadratics by
Method of Choice

** This is a 2-page document! **

Solve each equation by factoring, square roots, completing the square, or the quadratic formula. Simplify all irrational solutions.

1. $x^2 + 11x + 28 = 0$

$$(x+7)(x+4) = 0$$

$$x+7=0 \quad | \quad x+4=0$$

$$x=-7 \quad | \quad x=-4$$

$$x = \{-7, -4\}$$

2. $10x^2 - 12x = 0$

$$2x(5x-6) = 0$$

$$2x=0 \quad | \quad 5x-6=0$$

$$x=0 \quad | \quad x=\frac{6}{5}$$

$$x = \{0, \frac{6}{5}\}$$

3. $2x^2 - 4x = 3 \rightarrow 2x^2 - 4x - 3 = 0$

$$x = \frac{4 \pm \sqrt{(-4)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{4 \pm \sqrt{16+24}}{4}$$

$$x = \frac{4 \pm \sqrt{40}}{4} = \frac{4 \pm 2\sqrt{10}}{4} = \left\{ \frac{2 \pm \sqrt{10}}{2} \right\}$$

$$x = \{-2, 2\}$$

5. $10x^2 - x - 3 = 0$

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

$$(x-6)(x+\frac{1}{2}) = 0$$

$$(5x-3)(x+\frac{3}{5}) = 0$$

$$5x-3=0 \quad | \quad x+\frac{3}{5}=0$$

$$x=\frac{3}{5} \quad | \quad x=-\frac{3}{5}$$

$$x = \left\{ -\frac{1}{2}, \frac{3}{5} \right\}$$

6. $3x^2 - 36 = 12x$

$$3x^2 - 12x - 36 = 0$$

$$3(x^2 - 4x - 12) = 0$$

$$3(x-6)(x+2) = 0$$

$$3 \neq 0 \quad | \quad x-6=0 \quad | \quad x+2=0$$

$$x=6 \quad | \quad x=-2$$

$$x = \{-2, 6\}$$

8. $7 - 2x^2 = -47$

$$-2x^2 = -54$$

$$\sqrt{x^2} = \sqrt{27}$$

$$x = \pm \sqrt{27}$$

$$x = \pm 3\sqrt{3}$$

$$x = \{-3\sqrt{3}, 3\sqrt{3}\}$$

$$9. 6x^2 = x^2 + 5x$$

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

$$5x(x-1) = 0$$

$5x=0$	$x-1=0$
$x=0$	$x=1$

$$x = \{0, 1\}$$

$$10. 4x^2 - 2x + 1 = 2x$$

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

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

$$(x-2)(x-2) = 0$$

$2x-1=0$	$2x-1=0$
$x=\frac{1}{2}$	$x=\frac{1}{2}$

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

$2x-1=0$	$2x-1=0$
$x=\frac{1}{2}$	$x=\frac{1}{2}$

$$11. 3x^2 - 5x = 14 - 4x$$

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

$$x^2 - x - 42 = 0$$

$$(x-7)(x+6) = 0$$

$3x-7=0$	$x+2=0$
$x=\frac{7}{3}$	$x=-2$

$$x = \{-2, \frac{7}{3}\}$$

$$12. \frac{2}{3}x^2 - 7 = 0$$

$$\frac{2}{3}x^2 = 7$$

$$x^2 = \frac{21}{2}$$

$$x = \pm \sqrt{\frac{21}{2}}$$

$$x = \{-\sqrt{\frac{21}{2}}, \sqrt{\frac{21}{2}}\}$$

$$13. 4x^2 - 6x + 1 = 6$$

$$4x^2 - 6x - 5 = 0$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(4)(-5)}}{2(4)}$$

$$x = \frac{6 \pm \sqrt{36 + 80}}{8}$$

$$x = \frac{6 \pm \sqrt{116}}{8}$$

$$x = \left\{ \frac{3 \pm \sqrt{29}}{4} \right\}$$

$$-2x^2 + 24x - 24 = 0$$

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

$$x^2 - 12x = -12$$

$$(-6)^2 = 36$$

$$x^2 - 12x + 36 = -12 + 36$$

$$\sqrt{(x-6)^2} = \sqrt{24}$$

$$x-6 = \pm \sqrt{24}$$

$$x-6 = \pm 2\sqrt{6}$$

$$x = \{6 \pm 2\sqrt{6}\}$$

$$15. 16x^2 = 9$$

$$16x^2 = 9$$

$$x^2 = \frac{9}{16}$$

$$x = \pm \sqrt{\frac{9}{16}}$$

$$x = \pm \frac{3}{4}$$

$$x = \left\{ -\frac{3}{4}, \frac{3}{4} \right\}$$

$$16. 9x^2 - 6x + 10 = 11$$

$$9x^2 - 6x - 1 = 0$$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(9)(-1)}}{2(9)}$$

$$x = \frac{6 \pm \sqrt{36 + 36}}{18}$$

$$x = \frac{6 \pm \sqrt{72}}{18}$$

$$x = \frac{6 \pm 6\sqrt{2}}{18} = \left\{ \frac{1 \pm \sqrt{2}}{3} \right\}$$

Name: _____

Algebra I

Date: _____ Per: _____

Unit 8: Quadratic Equations

Quiz 8-4: Solving Quadratic Equations (All Methods)

Choose a method to solve each equation. You may only choose each method once.

1. $-x^2 + 25 = 0$

$-x^2 = -25$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

☐ F☒ SR☐ CS☐ QR

2. $2x^2 - 14x - 60 = 0$

$2(x^2 - 7x - 30) = 0$

$2(x-10)(x+3) = 0$

$x-10=0$	$x+3=0$
$x=10$	$x=-3$

☒ F☐ SR☐ CS☐ QR

1. $x^2 - 10x + 25 = 0$

$x = \frac{10 \pm \sqrt{10^2 - 4(1)(25)}}{2(1)}$

3. $x^2 - 10x + 25 = 0$

4. $x = \left\{ \frac{2 \pm 3\sqrt{3}}{2} \right\}$

3. $x^2 + 6x - 71 = 0$

$x^2 + 6x = 71$

$3^2 = 9$

$x^2 + 6x + 9 = 71 + 9$

$\sqrt{(x+3)^2} = \sqrt{80}$

$x+3 = \pm 4\sqrt{5}$

$x = -3 \pm 4\sqrt{5}$

☐ F☐ SR☒ CS☐ QR

4. $4x^2 - 12x + 3 = 0$

$x = \frac{12 \pm \sqrt{(-12)^2 - 4(4)(3)}}{2(4)}$

$x = \frac{12 \pm \sqrt{144 - 48}}{8}$

$x = \frac{12 \pm 10\sqrt{3}}{8}$

$x = \frac{3 \pm 2.5\sqrt{3}}{2}$

☐ SR☐ CS☒ QR

Solve each equation using your method of choice.

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

$(x-3)(x-3) = 0$

$x-3=0$

$x=3$

6. $2x^2 - 4x - 14 = 0$

$x = \frac{4 \pm \sqrt{(-4)^2 - 4(2)(-14)}}{2(2)}$

$x = \frac{4 \pm \sqrt{16 + 112}}{4}$

$x = \frac{4 \pm \sqrt{128}}{4}$

$x = \frac{4 \pm 8\sqrt{2}}{4} = 1 \pm 2\sqrt{2}$

5. $x = \{-3, 9\}$

6. $x = \{1 \pm 2\sqrt{2}\}$

7. $4x^2 - 15 = 66$

$$\frac{4x^2}{4} = \frac{81}{4}$$

$$\sqrt{x^2} = \sqrt{\frac{81}{4}}$$

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

8. $6x^2 + 12x = 5x + 3$

$$6x^2 + 7x - 3 = 0$$

$$x^2 + 7x - 18 = 0$$

$$(x+9)(x-2) = 0$$

$$\frac{(2x+3)(3x-1)}{2x+3} = 0$$

$$2x+3=0 \quad 3x-1=0$$

$$x = -\frac{3}{2} \quad x = \frac{1}{3}$$

7. $x = \{-\frac{9}{2}, \frac{9}{2}\}$

8. $x = \{-\frac{2}{3}, \frac{1}{3}\}$

9. $x = \{2\sqrt{3}\}$

10. $x = \{3\sqrt{6}\}$

11. $x = \{1 \pm 5\sqrt{6}\}$

12. $x = \{1 \pm 5\sqrt{6}\}$

B. $x = \{1 \pm 5\sqrt{6}\}$

9. $-x^2 - 36 = 14x + 1$

$$-x^2 - 14x - 37 = 0$$

$$x = \frac{14 \pm \sqrt{(-14)^2 - 4(-1)(-37)}}{2(-1)}$$

$$x = \frac{14 \pm \sqrt{196 - 148}}{-2}$$

$$x = \frac{14 \pm \sqrt{48}}{-2} = \frac{14 \pm 4\sqrt{3}}{-2}$$

10. $50 - \frac{1}{2}x^2 = 23$

$$-\frac{1}{2}x^2 = -27$$

$$\sqrt{x^2} = \sqrt{54}$$

$$x^2 = 54$$

$$x = \pm 3\sqrt{6}$$

11. $6x^2 - 14x = 0$

$$2x(3x-7) = 0$$

$$2x=0 \quad 3x-7=0$$

$$x=0 \quad x = \frac{7}{3}$$

12. $11x^2 - 7x - x^2 = 0$

$$3x^2 - 7x = 0$$

$$x = \frac{11 \pm \sqrt{(-11)^2 - 4(3)(-11)}}{2(3)}$$

$$x = \frac{11 \pm \sqrt{121 + 204}}{6}$$

$$x = \frac{11 \pm \sqrt{325}}{6} = \frac{11 \pm 5\sqrt{13}}{6}$$

BONUS: $(x-7)(x-10) = (x+10)(x-5)$

$$2x^2 - 11x + 14 = x^2 + 5x - 50$$

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

$$(x-8)(x-8) = 0$$

$$x-8=0 \quad x-8=0$$

$$x=8 \quad x=8$$

Name:

Date:

Topic:

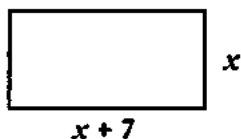
Class:

Main Ideas/Questions

Notes/Examples

AREA Problems

1. Given the diagram below, find the value of x if the area of the rectangle is 78 square meters.



$$\begin{aligned} x(x+7) &= 78 \\ x^2 + 7x - 78 &= 0 \\ (x+13)(x-6) &= 0 \\ x &= -13 \quad x = 6 \end{aligned}$$

2. Given the diagram below, find the dimensions of the rectangle if the area of the rectangle is 108 square meters.



$$\begin{aligned} x(x-2) &= 108 \\ x^2 - 2x - 108 &= 0 \\ (x-12)(x+9) &= 0 \\ x &= 12 \quad x = -9 \end{aligned}$$

12m, 9m

3. Find the dimensions of the rectangle below if the area is 128 square feet.



$$\begin{aligned} x(x+7) &= 128 \\ x^2 + 7x - 128 &= 0 \\ (x+15)(x-7) &= 0 \\ x &= -15 \quad x = 7 \end{aligned}$$

8ft, 16ft

4. The dimensions of a rectangle can be expressed as $x+3$ and $x-8$. If the area of the rectangle is 60 square inches, find the value of x .

$$\begin{aligned} (x+3)(x-8) &= 60 \\ x^2 - 5x - 24 &= 60 \\ x^2 - 5x - 84 &= 0 \\ (x-12)(x+7) &= 0 \\ x &= 12 \quad x = -7 \end{aligned}$$

x = 12 in

5. The length of a rectangular garden is 4 meters more than its width. The area of the rectangle is 60 meters. Find the dimensions of the rectangle.

$$\begin{aligned} \text{let } x &= \text{width} \\ x+4 &= \text{length} \end{aligned}$$

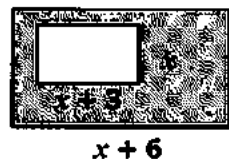
$$\begin{aligned} x(x+4) &= 60 \\ x^2 + 4x - 60 &= 0 \\ (x+10)(x-6) &= 0 \\ x &= -10 \quad x = 6 \end{aligned}$$

6m, 10m

6. The length of a rectangle is 6 meters less than its width. Find the dimensions of the rectangle if its area is 27 square meters.

$$\begin{aligned} \text{let } x &= \text{width} \\ x-6 &= \text{length} \\ x(x-6) &= 27 \\ x^2 - 6x - 27 &= 0 \\ (x-9)(x+3) &= 0 \\ x &= 9 \quad x = -3 \end{aligned}$$

9m, 3m



7. A square is altered so that one dimension is increased by 5 inches and the other dimension is decreased by 2 inches. If the area of the resulting rectangle is 98 square inches, find the area of the original square.

let x = square side
 $x+5$ = rectangle side
 $x-2$ = rectangle side

$$\text{Square } A = 9^2 = \boxed{81 \text{ in}^2}$$

$$\begin{aligned}(x+5)(x-2) &= 98 \\ x^2 + 3x - 10 &= 98 \\ x^2 + 3x - 108 &= 0 \\ (x+12)(x-9) &= 0 \\ x &= -12 \quad x = 9\end{aligned}$$

8. Given the diagram to the left, if the area of the shaded rectangle is 59 square inches, what are the dimensions of the outside rectangle?

$$\begin{aligned}(2x-1)(x+6) - x(x+3) &= 59 \\ 2x^2 + 11x - 6 - x^2 - 3x - 59 &= 0 \\ x^2 + 8x - 65 &= 0 \\ (x+13)(x-5) &= 0 \\ x &= -13 \quad x = 5\end{aligned}$$

$$\boxed{11 \text{ in}, 9 \text{ in}}$$

CONSECUTIVE INTEGER Problems

9. The product of two positive consecutive integers is 56. Find the integers.

$$\begin{aligned}\text{let } x &= 1^{\text{st}} \text{ consec. int.} \\ x+1 &= 2^{\text{nd}} \text{ consec. int.} \\ x(x+1) &= 56 \\ x^2 + x - 56 &= 0 \\ (x+8)(x-7) &= 0 \\ x &= -8 \quad x = 7\end{aligned}$$

$$\boxed{7, 8}$$

10. The product of two positive consecutive even integers is 80. Find the integers.

$$\begin{aligned}\text{let } x &= 1^{\text{st}} \text{ consec. even int.} \\ x+2 &= 2^{\text{nd}} \text{ consec. even int.} \\ x(x+2) &= 80 \\ x^2 + 2x - 80 &= 0 \\ (x+10)(x-8) &= 0 \\ x &= -10 \quad x = 8\end{aligned}$$

$$\boxed{8, 10}$$

11. Find three positive consecutive integers such that the square of the first, added to 3 times the second, is 24.

$$\begin{aligned}\text{let } x &= 1^{\text{st}} \text{ consec. pos. odd int.} \\ x+2 &= 2^{\text{nd}} \text{ consec. pos. odd int.} \\ x^2 + 3(x+2) &= 24 \\ x^2 + 3x + 6 &= 24 \\ x^2 + 3x - 18 &= 0 \\ (x+6)(x-3) &= 0 \\ x &= -6 \quad x = 3\end{aligned}$$

$$\boxed{3, 5}$$

12. Find three positive consecutive integers such that the product of the second integer and the third integer is 72.

$$\begin{aligned}\text{let } x &= 1^{\text{st}} \text{ pos. consec. int.} \\ x+1 &= 2^{\text{nd}} \text{ pos. consec. int.} \\ x+2 &= 3^{\text{rd}} \text{ pos. consec. int.} \\ (x+1)(x+2) &= 72 \\ x^2 + 3x + 2 &= 72 \\ x^2 + 3x - 70 &= 0 \\ (x+10)(x-7) &= 0 \\ x &= -10 \quad x = 7\end{aligned}$$

$$\boxed{7, 8, 9}$$

Name: _____

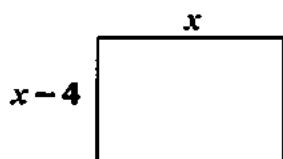
Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 13: Quadratic Equation Word Problems

** This is a 2-page document! **

1. Given the diagram below, find the value of x if the area is 21 square meters.



$$\begin{aligned} x(x-4) &= 21 \\ x^2 - 4x - 21 &= 0 \\ (x-7)(x+3) &= 0 \\ x=7 & \quad x=-3 \end{aligned}$$

7m

2. The dimensions of a rectangle can be expressed by $x+7$ and $x+2$. If the area of the rectangle is 66 square inches, what are the dimensions of the rectangle?

$$\begin{aligned} (x+7)(x+2) &= 66 \\ x^2 + 9x + 14 &= 66 \\ x^2 + 9x - 52 &= 0 \\ (x+13)(x-4) &= 0 \\ x &= -13 \quad x=4 \end{aligned}$$

11 in, 6 in

3. The length of a rectangle is 6 meters more than its width. If the area of the rectangle is 135 square meters, find its dimensions.

let x = width
 $x+6$ = length

$$\begin{aligned} x(x+6) &= 135 \\ x^2 + 6x - 135 &= 0 \\ (x-9)(x+15) &= 0 \\ x &= 9 \quad x=-15 \end{aligned}$$

9m, 15m

4. The length of a rectangle is 1 meter less than its width. If the area of the rectangle is 42 square meters, find its dimensions.

let x = width
 $x-1$ = length

$$\begin{aligned} x(x-1) &= 42 \\ x^2 - x - 42 &= 0 \\ (x-7)(x+6) &= 0 \\ x &= 7 \quad x=-6 \end{aligned}$$

7m, 6m

5. The length of a rectangle is 4 meters less than its width. If the area of the rectangle is 70 square meters, find its dimensions.

let x = width
 $x-4$ = length

$$\begin{aligned} x(x-4) &= 70 \\ x^2 - 4x - 70 &= 0 \\ 2(x^2 - 4x - 35) &= 0 \\ 2(x-7)(x+5) &= 0 \\ 2 \neq 0 & \quad x=7 \quad x=-5 \end{aligned}$$

7m, 10m

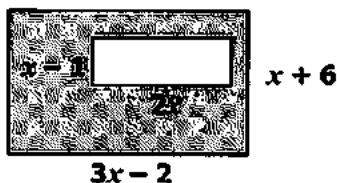
6. The dimensions of a square are altered so that one dimension is increased by 7 feet and the other is decreased by 2 feet. The area of the resulting rectangle is 90 square feet. Find the original area of the square.

let x = square side
 $x+7$ = rectangle side
 $x-2$ = rectangle side

$$\begin{aligned} (x+7)(x-2) &= 90 \\ x^2 + 5x - 14 &= 90 \\ x^2 + 5x - 104 &= 0 \\ (x+13)(x-8) &= 0 \\ x &= -13 \quad x=8 \end{aligned}$$

Area = 8^2 = 64 ft²

7. If the area of the shaded region in the diagram below is 103 square feet, what are the dimensions of the inside rectangle?



$$(3x-2)(x+6) - 2x(x-1) = 103$$

$$3x^2 + 16x - 12 - 2x^2 + 2x - 103 = 0$$

$$x^2 + 18x - 115 = 0$$

$$(x+23)(x-5) = 0$$

$$x = -23 \quad x = 5$$

10ft, 4ft

8. The side length of a square can be expressed as $2x + 3$. If the area of the square is 121 square meters, what is the value of x ?

$$(2x+3)^2 = 121$$

$$4x^2 + 12x + 9 = 121$$

$$4x^2 + 12x - 112 = 0$$

$$4(x^2 + 3x - 28) = 0$$

$$4(x+7)(x-4) = 0$$

$$x \neq -7 \quad x = 4$$

$x = 4m$

9. The product of two positive consecutive integers is 132. Find the integers.

let $x = 1^{st}$ consec. int.
 $x+1 = 2^{nd}$ consec. int.

$$x(x+1) = 132$$

$$x^2 + x - 132 = 0$$

$$(x+12)(x-11) = 0$$

$$x = -12 \quad x = 11$$

10. Find two positive even consecutive integers such that the square of the larger integer is 10 more than twice the square of the smaller integer.

let $x = 1^{st}$ consec. even int.
 $x+2 = 2^{nd}$ consec. even int.

$$x^2 = (x+2)^2 + 10$$

$$x^2 = x^2 + 4x + 4 + 10$$

$$0 = 4x + 14$$

$$-14 = 4x$$

$$x = -3.5$$

4 and 6

11. Find three positive consecutive integers such that the square of the third integer is 17 more than three times the square of the second integer.

let $x = 1^{st}$ consec. int.
 $x+1 = 2^{nd}$ consec. int.
 $x+2 = 3^{rd}$ consec. int.

$$(x+2)^2 = 3(x+1)^2 + 17$$

$$x^2 + 4x + 4 = 3x^2 + 6x + 3 + 17$$

$$x^2 + 4x + 4 = 3x^2 + 6x + 20$$

$$x^2 - 2x - 16 = 0$$

$$(x-5)(x+4) = 0$$

$$x = 5 \quad x = -4$$

5, 6, and 7

12. Find two positive consecutive odd integers such that the square of the larger integer is one less than twice the square of the smaller integer.

let $x = 1^{st}$ consec. odd int.
 $x+2 = 2^{nd}$ consec. odd int.

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

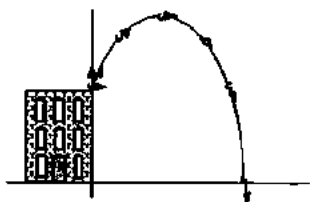
$$x^2 + 4x + 4 = 2x^2 - 1$$

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

$$0 = (x-5)(x+1)$$

$$x = 5 \quad x = -1$$

5 and 7



PROJECTILE MOTION Problems

1. A soccer ball is kicked from the ground with an initial upward velocity of 90 feet per second. The equation $h = -16t^2 + 90t$ gives the height h of the ball after t seconds.

a. Find the maximum height of the ball.

$$t = \frac{-90}{2(-16)} = \frac{-90}{-32} \approx 2.81$$

$$h = -16(2.81)^2 + 90(2.81) \approx \boxed{126.56}$$

b. How many seconds will it take for the ball to reach the ground?

$$\begin{aligned} -16t^2 + 90t &= 0 \\ -2t(8t - 45) &= 0 \\ t \neq 0 & \quad t = 5.625 \end{aligned}$$

2. An apple is launched directly upward at 64 feet per second from an 80-foot tall platform. The equation for this apple's height h in feet t seconds after launch is $h = -16t^2 + 64t + 80$.

a. Find the maximum height of the apple.

$$t = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$$

$$h = -16(2)^2 + 64(2) + 80 = \boxed{144}$$

b. How many seconds will it take for the apple to reach the ground?

$$\begin{aligned} -16t^2 + 64t + 80 &= 0 \\ -16(t^2 - 4t - 5) &= 0 \\ t^2 - 4t - 5 &= 0 \\ (t - 5)(t + 1) &= 0 \\ t = 5 & \quad t = -1 \end{aligned}$$

3. In science class, students were asked to create a container to hold an egg. They were told to drop this container from a window that is 25 feet above the ground. If the equation of the container's pathway can be modeled by the equation $h = -16t^2 + 25$, how long will it take the container to reach the ground?

a. Find the maximum height of the container.

$$t = \frac{0}{2(-16)} = 0$$

$$h = -16(0)^2 + 25 = \boxed{25}$$

b. How many seconds will it take for the container to reach the ground?

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

$$16t^2 = 25$$

$$\sqrt{t^2} = \sqrt{\frac{25}{16}}$$

$$t = \pm \frac{5}{4}$$

$$t = \boxed{1.25}$$

1a. 126.56 ft

5.625 sec

2a. 144 ft

b. 5 sec

3a. 25 ft

b. 1.25 sec

4. A penny is dropped off the Empire State Building, which is 1,250 feet tall. If the penny's pathway can be modeled by the equation $h = -16t^2 + 1250$, how long would it take the penny to strike a 6-foot tall person?

$$\begin{aligned} -16t^2 + 1250 &= 6 \\ -16t^2 &= -1244 \\ \frac{-16t^2}{-16} &= \frac{-1244}{-16} \end{aligned}$$

$$\begin{aligned} \sqrt{t^2} &= \sqrt{77.75} \\ t &\approx \pm 8.82 \end{aligned}$$

4. 8.82 sec

5. Some fireworks are fired vertically into the air from the ground at an initial speed of 80 feet per second. The equation for this object's height h at time t seconds after launch is $h = -16t^2 + 80t$. How long will it take the fireworks to reach the ground?

$$\begin{aligned} -16t^2 + 80t &= 0 \\ -16t(t-5) &= 0 \\ t=0 & \quad t=5 \end{aligned}$$

5. 5 sec

6. The Apollo's Chariot, a rollercoaster at Busch Gardens, moves at 100 feet per second. The equation of the ride can be represented by the equation $h = -16t^2 + 101t + 10$. What is the maximum height reached by this ride?

$$t = \frac{-101}{2(-16)} = \frac{-101}{-32} \approx 3.16$$

$$h = -16(3.16)^2 + 101(3.16) + 10 = 169.39$$

6. 169.39 ft

7. Eva is jumping on a trampoline. Her height h in feet can be modeled by the equation $h = -16t^2 + 20t + 6$. Would Eva reach a height of 14 feet?

$$t = \frac{-20}{2(-16)} = \frac{-20}{-32} = 0.625$$

$$h = -16(0.625)^2 + 20(0.625) + 6 = 12.25$$

7. No! Max = 12.25 ft

8. An astronaut on the Moon throws a baseball upward with an initial velocity of 10 meters per second, letting go of the baseball 2 meters above the ground. The equation of the baseball pathway can be modeled by $h = -1.6t^2 + 10t + 2$. The same experiment is done on Earth, in which the pathway is modeled by equation $h = -4.9t^2 + 10t + 2$. How much longer would the ball stay in the air on the Moon compared to on Earth?

$$\text{Moon: } t = \frac{-10 \pm \sqrt{10^2 - 4(-1.6)(2)}}{2(-1.6)}$$

$$t = \frac{-10 \pm \sqrt{106}}{-1.6}$$

$$t = -20, 12.70$$

$$\text{Earth: } t = \frac{-10 \pm \sqrt{10^2 - 4(-4.9)(2)}}{2(-4.9)}$$

$$t = \frac{-10 \pm \sqrt{139.2}}{-9.8}$$

$$t = -18, 2.22$$

8. 10.48 sec

$$\begin{aligned} 12.70 \\ - 2.22 \\ \hline 10.48 \end{aligned}$$

Name: _____

Unit 8: Quadratic Equations

Date: _____ Bell: _____

Homework 14: Projectile Motion

1. When a cannonball is fired, the equation of its pathway can be modeled by $h = -16t^2 + 128t$.a) Find the maximum height of the cannonball.

$$t = \frac{-128}{2(-16)} = \frac{-128}{-32} = 4$$

$$h = -16(4)^2 + 128(4) = \boxed{256 \text{ ft}}$$

b) Find the time it will take for the cannonball to reach the ground.

$$-16t^2 + 128t = 0$$

$$-16t(t-8) = 0$$

$$t=0 \quad t=8$$

8 sec2. When Joey dives off a diving board, the equation of his pathway can be modeled by $h = -16t^2 + 15t + 12$.a) Find Joey's maximum height.

$$t = \frac{-15}{2(-16)} = \frac{-15}{-32} \approx 0.47$$

$$h = -16(0.47)^2 + 15(0.47) + 12 = \boxed{15.52 \text{ ft}}$$

b) Find the time it will take for Joey to reach the ground.

$$-16t^2 + 15t + 12 = 0$$

$$t = \frac{-15 \pm \sqrt{15^2 - 4(-16)(12)}}{2(-16)}$$

$$t = \frac{-15 \pm \sqrt{99}}{-32} = -0.52, 1.45$$

1.45 sec3. A toy rocket is launched from a platform that is 48 feet above the ground. The rocket's height above the ground is modeled by $h = -16t^2 + 32t + 48$.a) Find the maximum height of the rocket.

$$t = \frac{-32}{2(-16)} = \frac{-32}{-32} = 1$$

$$h = -16(1)^2 + 32(1) + 48 = \boxed{64 \text{ ft}}$$

b) Find the time it will take for the rocket to reach the ground.

$$-16t^2 + 32t + 48 = 0$$

$$-16(t+2)(t-3) = 0$$

$$t = -2, 3$$

3 sec

At the end of the school year, Rachel and Amber threw their Algebra textbooks off the top of a 12-story building. The equation of the pathway of each book is given below. By how many seconds does Rachel's textbook beat Amber's textbook to the ground?

Rachel: $h = -16t^2 + 36t + 160$ Amber: $h = -16t^2 + 50t + 160$

$$t = \frac{-36 \pm \sqrt{36^2 - 4(-16)(160)}}{2(-16)}$$

$$= \frac{-36 \pm \sqrt{11536}}{-32}$$

$$= -2.73, 4.48$$

$$\begin{aligned} &5.09 \\ &-4.48 \end{aligned}$$

0.61 sec

$$t = \frac{-50 \pm \sqrt{50^2 - 4(-16)(160)}}{2(-16)}$$

$$= \frac{-50 \pm \sqrt{12740}}{-32}$$

$$= -1.96, 5.09$$

Name:

Date:

Topic:

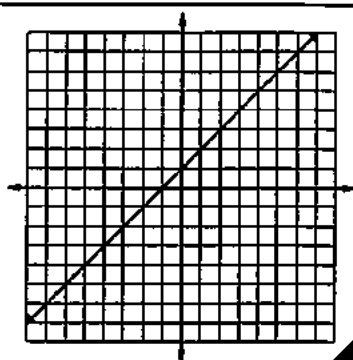
Class:

Main Ideas/Questions

Notes/Examples

LINEAR vs.
QUADRATIC
models

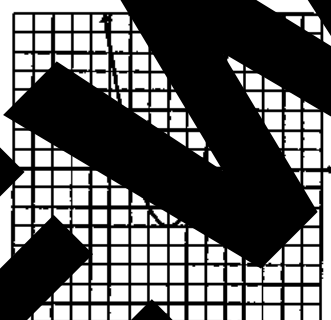
LINEAR



Equation:

$$y = mx + b$$

QUADRATIC



Equation:

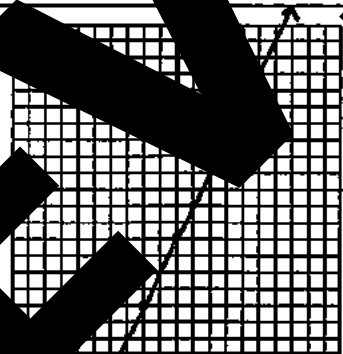
$$y = ax^2 + bx + c$$

Writing
EQUATIONS

Directions: Use a graph to determine the model. Then, write an equation to represent the data.

1.

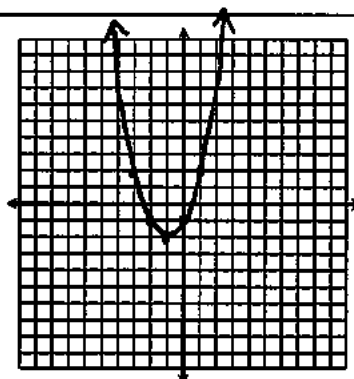
x	y
-7	3
-3	3
3	-3
5	-3

Linear or Quadratic? Linear

Equation:

$$y = 2x - 3$$

x	y
-3	2
-2	-1
-1	-2
0	-1
1	2

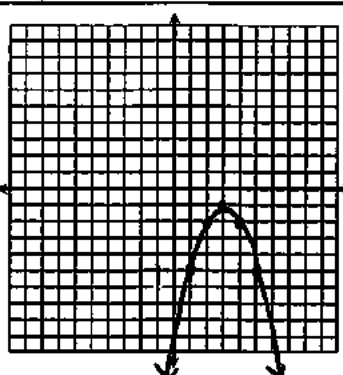
Linear or Quadratic? Quadratic

Equation:

$$y = x^2 + 2x - 1$$

3.

x	y
1	-5
2	-2
3	-1
4	-2
5	-5

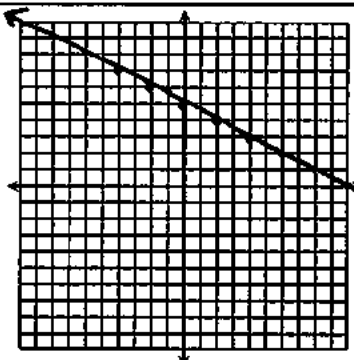
Linear or Quadratic? Quadratic

Equation:

$$y = -x^2 + 6x - 10$$

4.

x	y
-4	7
-2	6
0	5
2	4
4	3

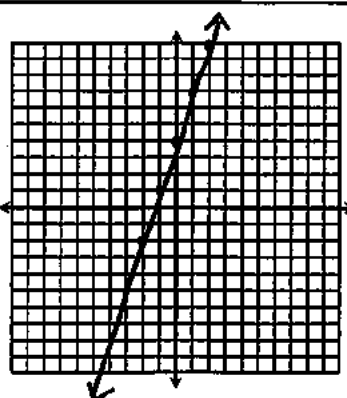
Linear or Quadratic? Linear

Equation:

$$y = -\frac{1}{2}x + 5$$

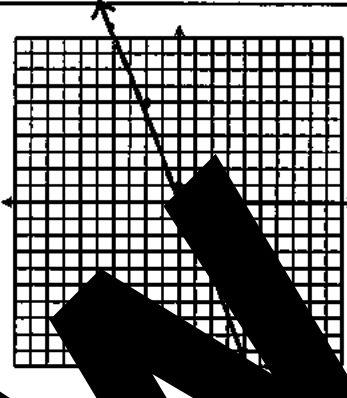
5.

x	y
-2	-2
-1	1
0	4
1	7
2	10

Linear or Quadratic? LinearEquation: $y = 3x - 4$

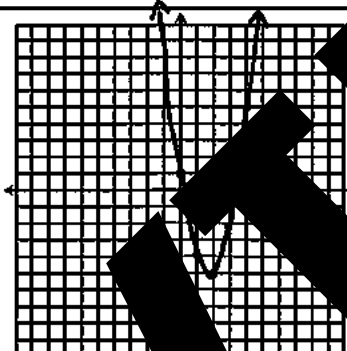
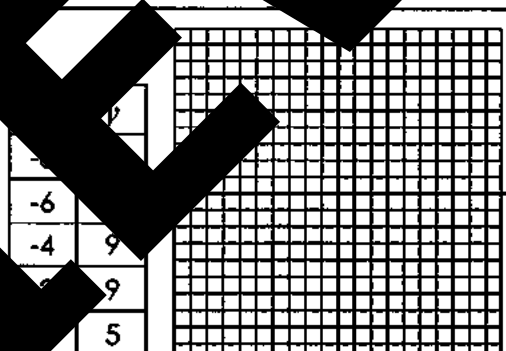
6.

x	y
-4	11
-2	6
0	1
2	-4
4	-9

Linear or Quadratic? QuadraticEquation: $y = -\frac{1}{2}x^2 + x + 1$

7.

x	y
0	1
1	-4
2	-5
3	-2
4	5

Linear or Quadratic? QuadraticEquation: $y = 2x^2 - 3x + 1$ Linear or Quadratic? QuadraticEquation: $y = -\frac{1}{2}x^2 - 3x + 5$

Making
PREDICTIONS

The value of V , of a computer between 1999 and 2003 is given in the table below. Write an equation for the line of best fit, then predict the value of V in the year 2008. ($x=9$)

		2	3	4	
t		2000	2001	2002	2003
V	800	720	640	572	480

Linear

$$y = -78.8x + 800$$

$$y = -78.8(9) + 800$$

$$= 90.80$$

10. A coin is thrown off the top of the Statue of Liberty, which is 305 feet from the ground. The height, h , of the coin is recorded after each second, t , in the table below. Write an equation for the curve of best fit, then predict the height of the coin after 7 seconds. ($x=7$)

t	h
0	305
1	367
2	397
3	395
4	361

$$y = -16x^2 + 78x + 305$$

$$y = -16(7)^2 + 78(7) + 305$$

$$y = 67 \text{ ft}$$

Quadratic

Name: _____

Unit 8: Quadratic Equations

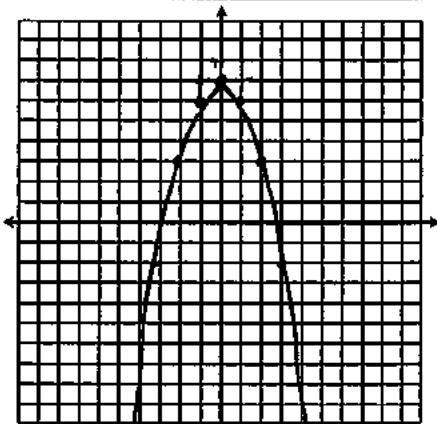
Date: _____ Bell: _____

Homework 15: Linear and Quadratic Models

**** This is a 2-page document! ******Determine if a linear or quadratic model exists. Then, find the equation for best fit.**

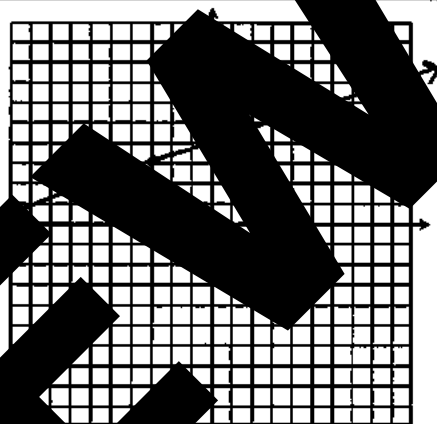
1.

x	y
-2	3
-1	6
0	7
1	6
2	3

Linear or Quadratic? QuadraticEquation: $y = -x^2 + 7$

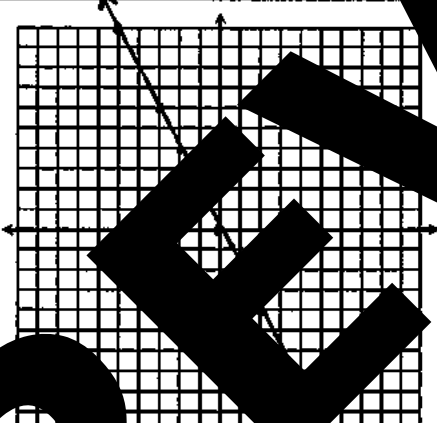
2.

x	y
-6	2
-3	3
0	4
3	6
6	8

Linear or Quadratic? LinearEquation: $y = 3x + 4$

3.

x	y
-5	10
-3	6
0	0
2	-4
4	-8

Linear or Quadratic? LinearEquation: $y = -2x$

x	y
-1	-1
-6	-7
-4	-9
-2	-7
0	-1

Linear or Quadratic? QuadraticEquation: $y = \frac{1}{2}x^2 + 4x - 1$

A real estate agent is trying to determine the relationship between the distance a 3-bedroom home is from New York City and its average selling price. He records the data for 6 homes in the table below. Write an equation for the line of best fit, then approximate the cost of a home located 90 miles from New York City.

	10	35	50	65	75	120
y	55,000	650,000	580,000	505,000	475,000	285,000

*x = miles from NYC; y = cost of home

$$y = -4291.10x + 795556.87$$

$$y = -4291.10(90) + 795556.87$$

$$y = \$409,357.87$$

6. A football is kicked into the air with an initial upward velocity of 82 feet per second. Its height, h (in feet), is recorded at various seconds, t , in the table below. Write an equation for the curve of best fit, then estimate the height of the football after 5 seconds.



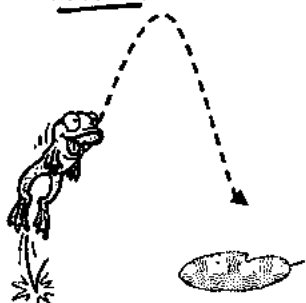
t	h
0	0
1	66
2	100
3	102
4	72

$$y = -16x^2 + 82x$$

$$y = -16(5)^2 + 82(5)$$

$$y = 10 \text{ ft}$$

7. A frog is jumping onto a lily pad. Its height, h (in feet), is recorded at various seconds, t , in the table below. Write an equation for the curve of best fit, then estimate the height of the frog after 6 seconds.



t	h
0	2
1	4.5
2	6
3	6.5
4	6

$$y = -\frac{1}{2}x^2 + 3x$$

$$y = -\frac{1}{2}(6)^2 + 3(6) + 2$$

$$y = 2 \text{ ft}$$

8. The table below shows the number of students enrolled at Mapleton High School since 2002. Write an equation for the line of best fit, then predict the number of students enrolled in 2011.

$$(x = 9)$$

Year	Students
2002	2910
2003	2920
2004	3080
2005	3136
2006	3296

$$y = 90.2x + 2910.2$$

$$y = 90.2(11) + 2910.2$$

$$y = 3722$$

9. A traffic study was conducted on a busy street. In 15-minute intervals from 6:30 a.m. to 8:00 a.m., the number of vehicles that passed a certain point in one minute was recorded in the table below. Write an equation for the curve of best fit, then approximate the number of cars that passed the point at 9:15 a.m. ($x = 165$)

x	0	15	30	45	60	75	90
y	32	48	71	80	98	86	81

* x = minutes past 6:30 a.m.; y = number of cars

$$y = -0.01x^2 + 1.84x + 28.48$$

$$y = -0.01(165)^2 + 1.84(165) + 28.48$$

$$y = 60 \text{ cars}$$

entrance ticket

Name: _____

Determine if the following data represents a linear or quadratic model. Then, using the equation for the line or curve of best fit, solve for the missing value.

1. The local theater puts on an annual play. The table below shows the number of auditions for the lead role each year since 2004. Using an equation to model the data, approximate the number of auditions that will be held in 2013.

	Year	Auditions
0	2004	21
1	2005	23
2	2006	26
3	2007	34
4	2008	38
5	2009	39
6	2010	41

$$y = 3.71x + 20.57$$

$$y = 3.71(9) + 20.57$$

$$y = 53.96$$

54 auditions

2. A toy rocket was fired into the air. The height, h , of the rocket at time t seconds is recorded in the table below. Using an equation to model the data, find the height of the rocket after 5 seconds.

t (sec)	h (ft)
0	0
1	76
2	120
3	132
4	112

$$h = -16t^2 + 92t$$

$$y = -16x^2 + 92(5)$$

$$h = 60 \text{ ft}$$

entrance ticket

Name: _____

Determine if the following data represents a linear or quadratic model. Then, using the equation for the line or curve of best fit, solve for the missing value.

1. The local theater puts on an annual play. The table below shows the number of auditions for the lead role each year since 2004. Using an equation to model the data, approximate the number of auditions that will be held in 2013.

	Year	Auditions
0	2004	21
1	2005	23
2	2006	26
3	2007	34
4	2008	38
5	2009	39
6	2010	41

2. A toy rocket was fired into the air. The height, h , of the rocket at time t seconds is recorded in the table below. Using an equation to model the data, find the height of the rocket after 5 seconds.

t (sec)	h (ft)
0	0
1	76
2	120
3	132
4	112

Unit 8 Test Study Guide

(Quadratic Equations)

Name: _____

Date: _____ Per: _____

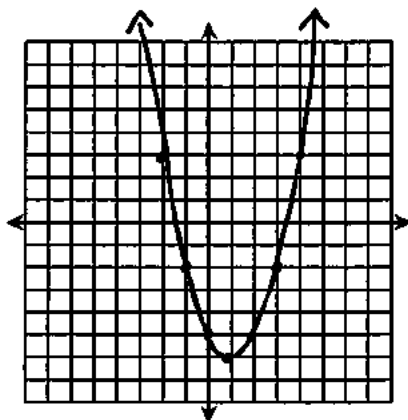
Topic 1: Graphing Quadratic Equations (from Standard Form and Vertex Form)

Graph each equation using a table of values. Identify all key characteristics.

1. $y = x^2 - 2x - 5$

$x = \frac{-(-2)}{2(1)} = 1$

x	y
-1	-2
0	-5
1	-6
2	-5
3	-2



Axis of Symmetry: $x = 1$

Vertex: $(1, -6)$

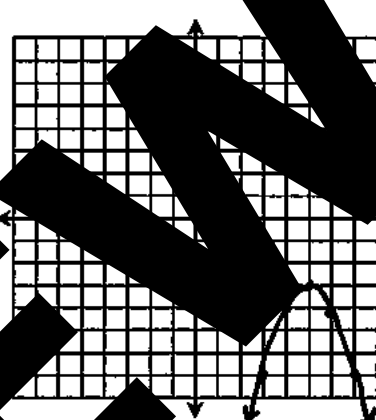
Domain: $\mathbb{R}$

Range: $y \geq -6$

2. $y = -x^2 + 10x - 28$

$x = \frac{-10}{2(-1)} = 5$

x	y
3	-7
4	-4
5	-3
6	-4
7	-7



Axis of Symmetry: $x = 5$

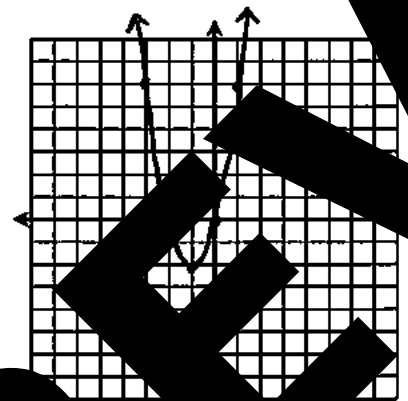
Vertex: $(5, -3)$

Domain: $\mathbb{R}$

Range: $y \leq -3$

3. $y = 2x^2 + 4x$

x	y
-3	6
-2	0
-1	-2
0	0
1	6



Axis of Symmetry: $x = -1$

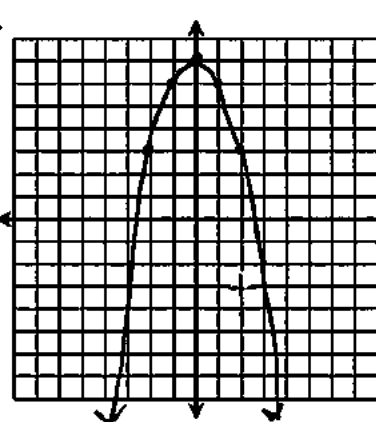
Vertex: $(-1, -2)$

Domain: $\mathbb{R}$

Range: $y \geq -2$

4. $y = -x^2 + 2x + 7$

x	y
-2	3
-1	6
0	7
1	6
2	3



Axis of Symmetry: $x = 1$

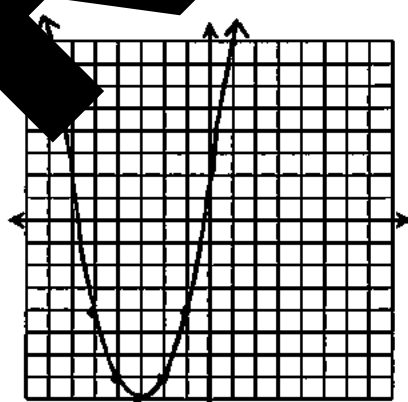
Vertex: $(1, 7)$

Domain: $\mathbb{R}$

Range: $y \leq 7$

5. $y = x^2 + 6x + 5$

x	y
-5	4
-4	-3
-3	-8
-2	-11
-1	-10



Axis of Symmetry: $x = -3$

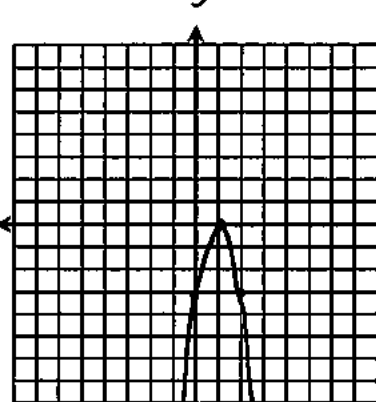
Vertex: $(-3, -8)$

Domain: $\mathbb{R}$

Range: $y \geq -8$

6. $y = -3(x - 1)^2$

x	y
-1	-12
0	-3
1	0
2	-3
3	-12



Axis of Symmetry: $x = 1$

Vertex: $(1, 0)$

Domain: $\mathbb{R}$

Range: $y \leq 0$

Topic 2: Vertex Form & Transformations

Describe the transformations from the parent function given each equation.

7. $y = -x^2 + 6$ Reflected across the x-axis Up 6	8. $y = (x+4)^2 - 1$ Left 4 and Down 1	9. $y = 2(x-5)^2 + 4$ Vertical stretch by 2, Right 5, up 4
10. If the graph of the function $y = x^2$ is reflected over the x-axis, then translated two units left, write an equation to represent the function. $y = -(x+2)^2$	11. If the graph of the function $y = x^2$ is compressed by a factor of $\frac{1}{4}$, then translated seven units right, write an equation to represent the function. $y = \frac{1}{4}(x-7)^2$	

Topic 3: Quadratic Roots (Zeros)

Graph each function, identify the zeros, then write the equation in vertex form, if possible.

12. $y = x^2 + 8x + 15$ Zeros: $x = -6, -2$ Factored Form: $y = (x+6)(x+2)$ Write each equation in factored form. Then, identify the zeros. $y = (x+3)(x+1) - 4$ $y = x^2 + 4x - 3$ Factored Form: $y = (x+3)(x-1)$ Zeros: $x = \{-3, 1\}$	13. $y = -2x^2 + 8x - 8$ Zeros: $x = \{0, 2\}$ Factored Form: $y = -2(x-2)(x-2)$ Factored Form: $y = 2(x-3)(x-3) - 18$ $y = 2(x^2 - 6x + 9) - 18$ $y = 2x^2 - 12x$ Factored Form: $y = 2x(x-6)$ Zeros: $x = \{0, 6\}$	14. $y = x^2 - 1$ Zeros: $x = \{-1, 1\}$ Factored Form: Not possible Factored Form: $y = -(x+5)(x+5) + 9$ $y = -(x^2 + 10x + 25) + 9$ $y = -x^2 - 10x - 16$ Factored Form: $y = (-x-2)(x+8)$ Zeros: $x = \{-8, -2\}$
--	---	---

Find the discriminant of each equation. Then, determine the number of solutions.

18. $y = -x^2 + 7x - 15$ ☐ 2
 $7^2 - 4(-1)(-15)$ ☐ 1
 $49 - 60$ ☒ 0
 -11

19. $y = 3x^2 - 12x$ ☒ 2
 $(-12)^2 - 4(3)(0)$ ☐ 1
 $144 - 0$ ☐ 0
 144

20. $y = x^2 - 20x + 100$ ☐ 2
 $(-20)^2 - 4(1)(100)$ ☒ 1
 $400 - 400$ ☐ 0
 0

Topic 4: Solving Quadratic Equations

Solve each equation. Simplify all irrational solutions.

21. $x^2 + 4x - 45 = 0$
 $(x+9)(x-5) = 0$
 $x+9=0 \quad x-5=0$
 $x=-9 \quad x=5$

$x = \{-9, 5\}$

22. $2x^2 - 9 = 39$
 $2x^2 = 48$
 $\frac{2x^2}{2} = \frac{48}{2}$
 $x^2 = 24$
 $x = \pm 2\sqrt{6}$

$x = \{\pm 2\sqrt{6}\}$

23. $x^2 - 10x - 3 = 0$
 $x^2 - 10x = 3$
 $\downarrow$
 $(-5)^2 = 25$
 $x^2 - 10x + 25 = 3 + 25$
 $\sqrt{(x-5)^2}$
 $x = 5 \pm \sqrt{28}$
 $x = 5 \pm 2\sqrt{7}$

$x = \{5 \pm 2\sqrt{7}\}$

24. $16x^2 = 10x$
 $x^2 - 10x = 0$
 $2x(8x-5) = 0$
 $2x=0 \quad 8x-5=0$
 $x=0 \quad x=\frac{5}{8}$

$x = \{0, \frac{5}{8}\}$

25. $3x^2 - 8 = 0$
 $3x^2 = 8$
 $x^2 = \frac{8}{3}$
 $\sqrt{(-8)^2 - 4(3)(-8)}$
 $2(3)$
 $x = \frac{\sqrt{64+96}}{6}$

$x = \frac{8 \pm \sqrt{160}}{6} = \frac{8 \pm 4\sqrt{10}}{6} = \left\{ \frac{4 \pm 2\sqrt{10}}{3} \right\}$

26. $-x^2 + 3x = x - 19$
 $-x^2 + 2x + 19 = 0$
 $x = \frac{-2 \pm \sqrt{2^2 - 4(-1)(19)}}{2(-1)}$
 $x = \frac{-2 \pm \sqrt{4+76}}{-2}$

$x = \frac{-2 \pm \sqrt{80}}{-2} = \frac{-2 \pm 4\sqrt{5}}{-2} = \{1 \pm 2\sqrt{5}\}$

$$27. x^2 - 2x - 17 = 0$$

$$x^2 - 2x = 17$$

$$\downarrow$$

$$(-1)^2 = 1$$

$$x^2 - 2x + 1 = 17 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{18}$$

$$x-1 = \pm \sqrt{18}$$

$$x = \{1 \pm 3\sqrt{2}\}$$

$$28. 6x^2 = 7x + 5$$

$$6x^2 - 7x - 5 = 0$$

$$x^2 - 7x - 30 = 0$$

$$(x-10)(x+3) = 0$$

$$(3x-5)(2x+1) = 0$$

$$3x-5=0 \quad 2x+1=0$$

$$x = \frac{5}{3} \quad x = -\frac{1}{2}$$

$$29. 2x^2 + 19 = 1 - 20x$$

$$2x^2 + 20x + 18 = 0$$

$$2(x^2 + 10x + 9) = 0$$

$$2(x+1)(x+9) = 0$$

$$2 \neq 0 \quad x+1=0 \quad x+9=0$$

$$x=-1 \quad x=-9$$

$$x = \{-1, -9\}$$

$$30. 25x^2 + 1 = 50x$$

$$25x^2 - 50x + 1 = 0$$

$$25x^2 - 50x + 25 = 24$$

$$(5x-5)^2 = 24$$

$$5x-5 = \pm \sqrt{24}$$

$$5x = 5 \pm \sqrt{24}$$

$$x = \frac{5 \pm \sqrt{24}}{5}$$

$$x = \left\{ \frac{5 - \sqrt{24}}{5}, \frac{5 + \sqrt{24}}{5} \right\}$$

$$31. \frac{1}{2}x^2 - 42 = 8$$

$$2 \cdot \frac{1}{2}x^2 = 50 \cdot 2$$

$$\sqrt{x^2} = \sqrt{100}$$

$$x = \pm 10$$

$$x = \{-10, 10\}$$

$$x^2 + 9x + 13 = 4$$

$$x^2 + 9x + 9 = 0$$

$$x = \frac{-9 \pm \sqrt{9^2 - 4(1)(9)}}{2(1)}$$

$$x = \frac{-9 \pm \sqrt{81 - 36}}{2}$$

$$x = \frac{-9 \pm \sqrt{45}}{2}$$

$$x = \left\{ \frac{-9 \pm 3\sqrt{5}}{2} \right\}$$

Topic 5: Quadratic and Consecutive Integer Problems

If the area of the rectangle below is 42 inches squared, find the value of x.



$$x-3$$

$$x+8$$

$$(x+8)(x-3) = 42$$

$$x^2 + 5x - 24 = 42$$

$$x^2 + 5x - 66 = 0$$

$$(x+11)(x-6) = 0$$

$$x \neq -11 \quad x = 6$$

$$x = 6 \text{ in}$$

34. The length of a rectangle is five feet less than its width. If the area of the rectangle is 84 square feet, find its dimensions.

let $x = \text{width}$

$x-5 = \text{length}$

$$x(x-5) = 84$$

$$x^2 - 5x - 84 = 0$$

$$(x-12)(x+7) = 0$$

$$x=12 \quad x \neq -7$$

$$(12 \text{ ft}, 7 \text{ ft})$$

35. A square was altered so that one side is increased by 9 inches and the other side is decreased by 2 inches. The area of the resulting rectangle is 60 square inches. What was the area of the original square?

let x = square side
 $x+9$
 $x-2$ } rectangle sides

$$(x+9)(x-2) = 60$$

$$x^2 + 7x - 18 = 0$$

$$(x+13)(x-6) = 0$$

$$x = -13 \quad x = 6$$

$$\text{Area} = 6^2$$

$$= 36 \text{ in}^2$$

36. Find two consecutive positive integers such the sum of their squares is 145.

let x = 1st consec int
 $x+1$ = 2nd consec int

$$x^2 + (x+1)^2 = 145$$

$$x^2 + x^2 + 2x + 1 = 145$$

$$2x^2 + 2x - 144 = 0$$

$$2(x^2 + x - 72) = 0$$

$$2(x+9)(x-8) = 0$$

$$x = -9 \quad x = 8$$

Topic 6: Projectile Motion

37. Natalie found a tennis ball outside a tennis court. She picked up the ball and threw it over the fence into the court. The path of the ball can be represented by the equation $h = -16t^2 + 18t + 5$.

- a. Find the maximum height of the tennis ball.

$$t = \frac{-18}{2(-16)} = .56$$

$$h = -16(.56)^2 + 18(.56) + 5$$

$$= 10.06 \text{ ft}$$

- b. How long will it take to reach the ground?

$$-16t^2 + 18t + 5 = 0$$

$$t = \frac{-18 \pm \sqrt{18^2 - 4(-16)(5)}}{2(-16)}$$

$$t = \frac{-18 \pm \sqrt{324 + 320}}{-32}$$

$$t = \frac{-18 \pm \sqrt{644}}{-32}$$

$$t = .23, 1.36$$

$$1.36 \text{ sec}$$

38. A circus acrobat is shot out of a cannon with an upward speed of 50 ft/s. The equation for the acrobat's pathway can be represented by the equation $h = -16t^2 + 50t + 4$.

- a. Find the maximum height of the acrobat.

$$t = \frac{-50}{2(-16)} = 1.56$$

$$h = -16(1.56)^2 + 50(1.56) + 4$$

$$= 40.06 \text{ ft}$$

- b. How long will it take to reach the ground?

$$-16t^2 + 50t + 4 = 0$$

$$t = \frac{-50 \pm \sqrt{50^2 - 4(-16)(4)}}{2(-16)}$$

$$t = \frac{-50 \pm \sqrt{2756}}{-32}$$

$$t = -.08, 3.20$$

$$3.20 \text{ sec}$$

Topic 7: Quadratic Models

Kate recorded the time it took six children of different ages to run one lap around the track. Write an equation for the line of best fit, then use the equation to find the length of time it would take for her old brother to run one lap.

Age (years)	Time (s)
10	180
11	137
12	126
12	124
15	102
16	78

$$y = -12.91x + 285.88$$

$$y = -12.91(5) + 285.88$$

$$y = 221.33$$

$$221 \text{ sec}$$

40. A pistol is accidentally discharged vertically in the air. The height, h , of the bullet at time t seconds is recorded in the table below. Using an equation for the curve of best fit, find the height of the pistol after 10 seconds.

t (s)	h (ft)
0	3
1	187
2	339
3	459
4	547

$$y = -16x^2 + 200x + 3$$

$$y = -16(10)^2 + 200(10) + 3$$

$$y = 403 \text{ ft}$$

Name: _____

Date: _____ Per: _____

Algebra I Unit 8 Test

Quadratic Equations

Find the axis of symmetry and vertex for the following equations.

1. $y = -x^2 - 4x + 1$

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(-1)} = -2$$

$$y = -(-2)^2 - 4(-2) + 1 = 5$$

Axis of Symmetry

Vertex

$x = -2$

$(-2, 5)$

2. $y = 2x^2 + 8$

$$x = \frac{-b}{2a} = \frac{0}{2(2)} = 0$$

$y = 2(0)^2 + 8 = 8$

Axis of Symmetry

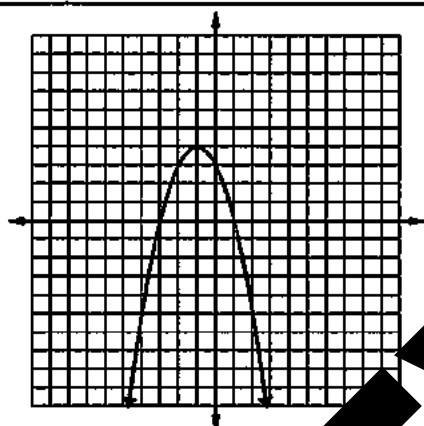
Vertex

$x = 0$

$(0, 8)$

Complete each part using the given graph.

3.



Axis of Symmetry

$x = 1$

Vertex

$(1, 4)$

Domain:

$\mathbb{R}$

Range:

$y \leq 4$

Equation:

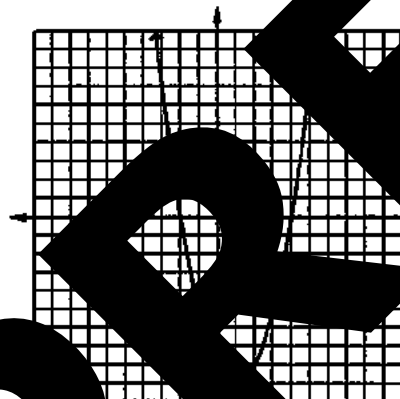
A. $y = x^2 + 2x + 3$

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

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

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

4.



Axis of Symmetry

$x = 1$

Vertex

$(1, -9)$

Domain:

$\mathbb{R}$

Range:

$y \geq -9$

Zeros:

$x = \{-2, 4\}$

Equation:

A. $y = (x - 1)^2 - 9$

C. $y = (x - 9)^2 + 1$

B. $y = (x + 1)^2 - 9$

D. $y = (x + 9)^2 + 1$

The graph of the function $y = x^2$ is reflected across the x-axis, then translated two units left and three units down, write an equation to represent the new function.

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

6. If the graph of the function $y = x^2$ is translated so its vertex is now at the point $(0, -3)$, which equation represents the new function?

A. $y = (x - 3)^2$

B. $y = (x + 3)^2$

C. $y = x^2 - 3$

D. $y = x^2 + 3$

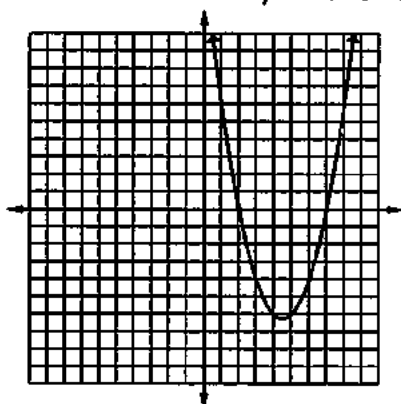
C

7. Given the function, check all transformations that occurred from the graph of the function $y = x^2$.

$$y = \frac{1}{3}(x+7)^2 + 4$$

☐ up 7 units	☒ up 4 units	☐ vertical stretch
☐ down 7 units	☐ down 4 units	☒ vertical compression
☒ left 7 units	☐ left 4 units	☐ reflection in x-axis
☐ right 7 units	☐ right 4 units	☐ reflection in y-axis

8. Choosing from the binomial factors shown below, write the equation of the parabola shown on the grid in factored form. Write your answers in the boxes.



☐ $x - 2$	☐ $x + 7$
☐ $x - 7$	☐ $x + 2$

$$y = (x - 2)(x - 7)$$

9. Write the equation below in standard form, then identify the zeros.

$$y = -(x-1)^2 + 25$$

$$y = -(x^2 - 2x + 1) + 25$$

$$y = -x^2 + 2x + 24 \rightarrow -(x^2 - 2x - 24)$$

$$-(x-6)(x+4)$$

Standard Form:

Factored Form

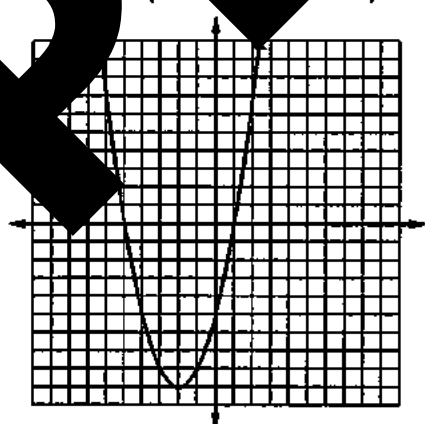
Zeros:

$$y = -x^2 + 2x + 24$$

$$y = -(x-6)(x+4)$$

$$x = \{-4, 6\}$$

Select the equation that represent the parabola graphed below.



☐ $y = (x-5)(x+1)$	☐ $y = x^2 - 4x - 5$
☒ $y = (x+5)(x-1)$	☒ $y = (x+2)^2 - 9$
☒ $y = x^2 + 4x - 5$	☐ $y = (x-2)^2 - 9$

11. Which quadratic equations have two solutions? Check all that apply.

$$d = (-8)^2 - 4(1)(-20) = 144$$

☒ $y = x^2 - 8x - 20$	☒ $y = x^2 - 25$
☐ $y = x^2 + 3$	☐ $y = 4x^2 + 12x + 9$
☐ $y = -x^2 + 2x - 1$	☐ $y = -2x^2 - 5x - 4$

$$d = 0^2 - 4(1)(-25) = 100$$

Solve each equation. Simplify all irrational solutions.

12. $x^2 + 10x = 24$

$$x^2 + 10x - 24 = 0$$

$$(x + 12)(x - 2) = 0$$

$$x = -12 \quad x = 2$$

$$x = \{-12, 2\}$$

13. $4x^2 + 5 = 6$

$$4x^2 = 1$$

$$\frac{4x^2}{4} = \frac{1}{4}$$

$$x^2 = \frac{1}{4}$$

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

$$x = \left\{-\frac{1}{2}, \frac{1}{2}\right\}$$

14. $x^2 + 18x = 4x - 49$

$$x^2 + 14x + 49 = 0$$

$$(x + 7)(x + 7) = 0$$

$$x = -7 \quad x = -7$$

$$x = \{-7\}$$

$$x^2 - 6x - 23 = 0$$

$$x^2 - 6x = 23$$

$$\downarrow$$

$$(-3)^2 = 9$$

$$x^2 - 6x + 9 = 23 + 9$$

$$\sqrt{(x-3)^2} = \sqrt{32}$$

$$x - 3 = \pm \sqrt{32}$$

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

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

17. $\frac{2}{3}x^2 + 15 = 23$

$$\frac{3}{2} \cdot \frac{2}{3}x^2 = 8 \cdot \frac{3}{2}$$

$$\sqrt{x^2} = \sqrt{12}$$

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

$$x = \{0, 9\}$$

$$x = \{-2\sqrt{3}, 2\sqrt{3}\}$$

18. $5x^2 + 14x = x + 6$

$$5x^2 + 13x - 6 = 0$$

$$x^2 + 13x - 30 = 0$$

$$(x + \frac{15}{5})(x - \frac{2}{5}) = 0$$

$$\frac{(x+3)(5x-2)=0}{x = -3 \quad x = \frac{2}{5}}$$

$$x = \{-3, \frac{2}{5}\}$$

19. $2x^2 - 10x + 11 = 0$

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4(2)(11)}}{2(2)}$$

$$x = \frac{10 \pm \sqrt{100 - 88}}{4}$$

$$x = \frac{10 \pm \sqrt{12}}{4}$$

$$x = \frac{10 \pm 2\sqrt{3}}{4}$$

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

20. $4x^2 - 24 = 20x$

$$4x^2 - 20x - 24 = 0$$

$$4(x^2 - 5x - 6) = 0$$

$$\frac{4(x-6)(x+1)=0}{4 \neq 0 \quad x=6 \quad x=-1}$$

$$x = \{6, -1\}$$

21. $x^2 + 8 = -2x$

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

$$x = \frac{-2 \pm \sqrt{(-2)^2 - 4(1)(8)}}{2(1)}$$

$$x = \frac{-2 \pm \sqrt{4 - 32}}{2}$$

$$x = \frac{-1 \pm \sqrt{45}}{-2}$$

$$x = \frac{-1 \pm 3\sqrt{5}}{-2}$$

$$x = \left\{ \frac{-1 \pm 3\sqrt{5}}{-2} \right\}$$

22. Which equation has solutions of -2 and 3?

A. $y = x^2 + x - 6$

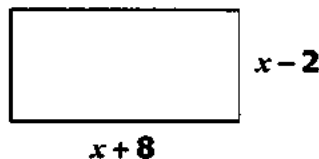
(B) $y = x^2 - x - 6 \rightarrow (x-3)(x+2)$

C. $y = x^2 + 5x + 6$

D. $y = x^2 - 5x + 6$

B

23. If the area of the rectangle below is 39 square feet, find the value of x.



$$(x+8)(x-2) = 39$$

$$x^2 + 6x - 16 = 39$$

$$x^2 + 6x - 55 = 0$$

$$(x+11)(x-5) = 0$$

$$\frac{x+11}{x \neq -11} \quad x=5$$

$$x = 5 \text{ ft}$$

24. A square is altered so that one dimension is increased by 5 meters and the other dimension is increased by 3 meters. If the area of the resulting rectangle is 99 square meters, find the area of the original square.

let x = square side
 $x+5$
 $x+3$ } rectangle sides

$$(x+5)(x+3) = 99$$

$$x^2 + 8x - 84$$

$$(x+14)(x-6) = 0$$

$$x = -14 \quad x = 6$$

$$\text{Area} = 6^2 = 36$$

$$36 \text{ m}^2$$

25. The length of a rectangle is seven less than twice the length of its width. If the area of the rectangle is 15 square meters, find the value of x .

let x = width
 $2x - 7$ = length

$$x(2x-7) = 15$$

$$2x^2 - 7x - 15 = 0$$

$$x^2 - 7x - 30 = 0$$

$$(x-10)(x+3) = 0$$

$$(x-5)(x+6) = 0$$

$$x = 5 \quad x = -6$$

26. Find two consecutive positive integers such that the square of the larger integer is 19 more than nine times the smaller integer.

let x = 1st consec. int.

$x+1$ = 2nd consec. int.

$$(x+1)^2 = 9x + 19$$

$$x^2 + 2x + 1 = 9x + 19$$

$$x^2 - 7x - 18 = 0$$

$$(x-9)(x+2) = 0$$

$$x = 9 \quad x = -2$$

$$9, 10$$

27. April shoots an arrow upward at a speed of 80 feet per second from a platform 25 feet high. The pathway of the arrow is represented by the equation $h = -16t^2 + 80t + 25$, where h is the height and t is the time in seconds. What is the maximum height of the arrow?

$$t = \frac{-80}{-32} = \frac{-80}{-32}$$

$$h = -16(2.5)^2 + 80(2.5) + 25$$

$$h = 125$$

- A. 80 feet
 B. 90 feet
 C. 125 feet
 D. 140 feet

$$C$$

28. A rock is dropped from a bridge 320 feet above a river. The pathway that the rock takes can be modeled by the equation $h = -16t^2 + 320$. How long will it take the rock to reach the river?

$$-16t^2 + 320 = 0$$

$$\frac{-16t^2}{-16} = \frac{-320}{-16}$$

$$\sqrt{t^2} = \sqrt{20}$$

$$t = \pm 4.5$$

- A. 2.5 sec
 B. 3.5 sec
 C. 3.8 sec
 D. 4.5 sec

$$D$$

29. The table shows student enrollment at a college by year. Write an equation for the line of best fit, then find the approximate enrollment for the year 2010.

$$X=12$$

	x	y
0	1998	950
1	1999	995
2	2000	1011
3	2001	1020
4	2002	1035

$$y = 19.5x + 963.2$$

$$y = 19.5(12) + 963.2$$

$$y = 1197$$

A. 1128 people

B. 1152 people

C. 1197 people

D. 1215 people

30. The Sears Tower, at 1,451 feet, is one of the tallest structures in the United States. A penny is thrown from the top of the tower. The height, h , of the penny is recorded after each second, as shown in the table. Write an equation for the curve of best fit, then find the approximate height of the penny after 7 seconds.

t	h
0	1451
1	1470
2	1457
3	1412
4	1334

$$y = -16.14x^2 + 39.87x + 1451.91$$

$$y = -16.14(7)^2 + 39.87(7) + 1451.91$$

$$y = 907$$

A. 907 feet

B. 912 feet

C. 923 feet

D. 928 feet

A

BONUS: Find the solution(s) to the quadratic equation below.

$$(x+8)^2 - 3(x+2) = 2(x+9)$$

$$x^2 + 16x + 64 - 3x - 6 = 2x + 18$$

$$2x^2 - 19x + 58 = 2x + 18$$

$$2x^2 - 21x + 40 = 0$$

$$x^2 - 21x + 80 = 0$$

$$(x-16)\left(\frac{x-5}{2}\right) = 0$$

$$\frac{(x-8)(2x-5)}{2} = 0$$

$$x=8 \quad x=\frac{5}{2}$$

$$x = \left\{ \frac{5}{2}, 8 \right\}$$

CREDITS

I use clipart and
fonts in my products



Many thanks to these
talented artists!