DeSoto
COUNTY SCHOOLS

Yearlong Algebra I

Week 6

Name: _____ Date: _____

More Work with the Zero Product Law
Algebra 1 Homework

Skills

1. Which of the following represents the solution set of $x^2+3x-5=3x-1$?

(1) $\{-2,2\}$ (3) $\{-3,5\}$

(2) $\{-1,5\}$ (4) $\{-5,3\}$

2. Solve each of the following quadratic equations. Check your answers using **STORE**.

(a) $x^2+9x-11=5x+10$

(b) $x^2-4x+45=10x+5$

(c) $5x^2+7x=-3x+15$

(d) $2x^2+4x-10=4x+8$

(e) $x^2+6x+46=-6x+10$

(f) $x^2+x+3=6x+3$

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More Work with the Zero Product Law
Algebra 1

In the last lesson we used the Zero Product Law to solve quadratic equations that were already in the form $ax^2+bx+c=0$. This is called the **standard form** of a quadratic equation. Commonly, we have quadratic equations where we must manipulate the equation using algebraic techniques to place it in standard form.

Exercise #1: Consider the quadratic equation $x^2-x=6$.

(a) What is the error with the solution below?

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

$$x=6 \text{ or } x-1=6$$

$$x=6 \text{ or } x=7$$

$$\{6,7\}$$

(b) Solve the quadratic by first placing it in standard form and then using the Zero Product Law.

As we should see clearly from *Exercise* #1, we cannot use the Zero Product Law unless we have a product equal to ZERO. Thus, we should always begin by getting one side of our quadratic equation equal to zero.

Exercise #2: Consider the quadratic equation $x^2+5x-5=3x+10$.

(a) Rearrange this equation so that the right hand side is equal to zero.

(b) Solve the equation using the Zero Product Law.

Exercise #3: Solve each of the following by first placing the quadratic equation in standard form.

(a) $2x^2-4x+3=6x+3$

(b) $2x^2+7x=7x+50$

Additional Classroom Exercises

Solve each of the following quadratic equations. Check your answers by using **STORE**.

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

2. $x^2+7x+24=-2x+4$

3. $x^2+5x-30=5x+6$

4. $3x^2-13x-4=8x-4$

5. $2x^2+11x-20=5x+16$

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

7. $x^2+6x+8=2x+8$

8. $x^2+4x+6=10x-2$

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Using Quadratic Functions to Factor
Algebra 1

Recall a **quadratic function** is any function that can be written in the form:

$$y = ax^2 + bx + c \quad \text{where} \quad a \neq 0$$

Clearly there is a connection between quadratic equations and quadratic functions. Today we will investigate how to use quadratic functions to help us factor.

Exercise #1: Consider the quadratic expression $x^2 - 4x - 5$.

(a) Factor the expression $x^2 - 4x - 5$.

(b) Solve the equation $x^2 - 4x - 5 = 0$.

When we set a function equal to zero and solve the resulting equation, we are finding the **zero(s)** of the function. Clearly, there is a connection between the **zero(s)** of a function and how the function can be written in factored form.

Exercise #2: The two roots of a quadratic equation are given by the set $\{-3, 9\}$. Which of the following would be the factors associated with these roots?

(1) $(x-3)(x+9)$

(2) $9x(x+3)$

(3) $3x(x-9)$

(4) $(x+3)(x-9)$

Because of this strong connection between the roots and factors of a given quadratic, we can use the zeros to help find the factors.

Exercise #3: Consider the quadratic function $y = x^2 - 2x - 8$.

(a) Using your calculator, fill out the table to the right for this function.

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

(b) Use your table to solve the equation $x^2 - 2x - 8 = 0$ for all values of x. Check your answers by using **STORE**.

(c) Considering your answer from (b), factor the expression $x^2 - 2x - 8$. Check that you answer is correct by multiplying the binomials.

Reasoning

3. Solve and check the following quadratic equation.

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

4. Consider the **cubic equation** $x^3-2x^2-15x=0$.

   (a) Rewrite this equation by completely factoring the left side.

   (b) Solve and check the cubic equation using the Zero Product Law.

5. Which of the following quadratic equations, in factored form, has the solution set $\{-3,5\}$?

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

   (2) $3x(x-5)=0$ (4) $5x(x+3)=0$

6. (a) Write a quadratic equation in factored from that has a solution set of $\{-6,3\}$.

   (b) Write this quadratic equation in the form $x^2+bx+c=0$.

7. Consider the quadratic equation $x^2+x-6=0$.

   (a) Enter the left-hand side of this equation in $\mathbf{Y_1}$ of your calculator and fill out the table to the right.

   (b) Considering your table from (a), what values of x solve the original quadratic equation?

   (c) Use your answers from part (b) to factor the trinomial x^2+x-6.

x	$\mathbf{Y_1}$
-3	
-2	
-1	
0	
1	
2	
3	

Exercise #4: Use your calculator and the associated quadratic function to factor each of the following quadratic expressions. Check your factoring by multiplying the binomials.

(a) $x^2+2x-15$

(b) x^2-4

(c) $x^2+4x-45$

(d) x^2-4x

(e) $x^2-12x+32$

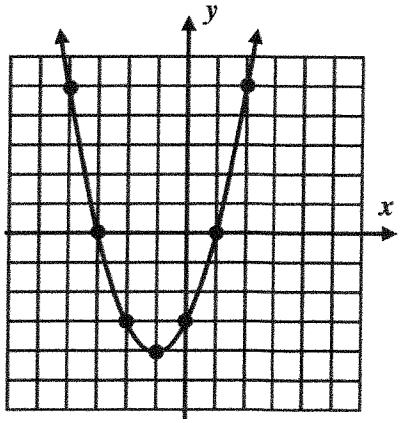
(f) x^2+6x

(g) $x^2-10x-75$

(h) $x^2-8x-240$

(i) $x^2+5x-500$

Exercise #5: The graph of a quadratic function of the form $y=x^2+bx+c$ is shown below.



(a) State the zeros of this quadratic function. Remember, the zeros are the x-values at which the y-value is equal to zero.

(b) Based on (a), what must be the factored form of the quadratic function?

(c) Write the equation of the quadratic function in $y=x^2+bx+c$ form.

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Using Quadratic Functions to Factor
Algebra 1 Homework

Skills

1. Which of the following represents the factored form of $x^2 - x - 42$?

   (1) $(x-7)(x+6)$ (3) $(x+8)(x-6)$

   (2) $(x-8)(x+6)$ (4) $(x+7)(x-6)$

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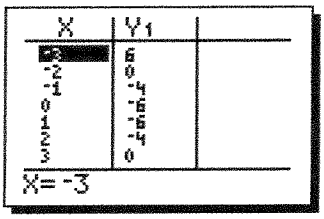
2. Sharise produced the following table on her calculator for $y_1 =$ a certain quadratic whose leading coefficient equals one. Which of the following must be the factored form of the quadratic?

   (1) $(x-2)(x+3)$ (3) $(x+6)(x-2)$

   (2) $(x-6)(x-3)$ (4) $(x+2)(x-3)$



X	Y1
-3	6
-2	0
-1	-4
0	-6
1	-6
2	-4
3	0

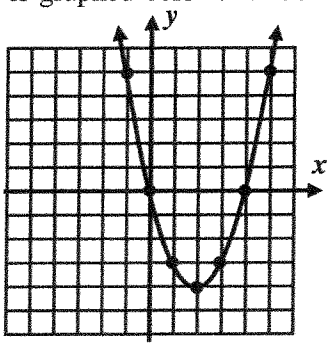
X= -3

_____

3. A quadratic function of the form $y = x^2 + bx + c$ is graphed below. Which of the following is its equation?

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

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



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4. The x-intercepts of a parabola whose leading coefficient is one are $\{-7, 7\}$.

(a) What must be the factors of the quadratic?

(b) Write this quadratic function in $y = ax^2 + bx + c$ form.

(c) If the equation from (b) were graphed, what would be the parabola's y-intercept? Recall that the y-intercept ALWAYS occurs when $x = 0$.

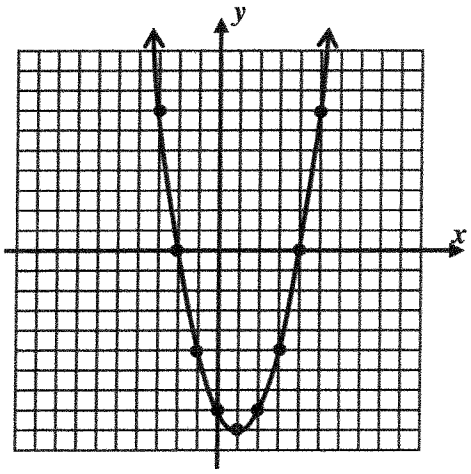
5. Factor each of the following quadratic expressions by using tables on your calculator. Check that your factors are correct using multiplication.

(a) $x^2+13x+40$ (b) x^2-25 (c) $x^2+7x-30$

(d) x^2-6x (e) $x^2+8x-65$ (f) $x^2+6x-187$

6. Each graph shown below represents a quadratic function of the form $y=x^2+bx+c$. Use the graph to determine the zeros of the function. Then, determine the binomial factors of the function, and express the quadratic function in its $y=x^2+bx+c$ form.

(a)

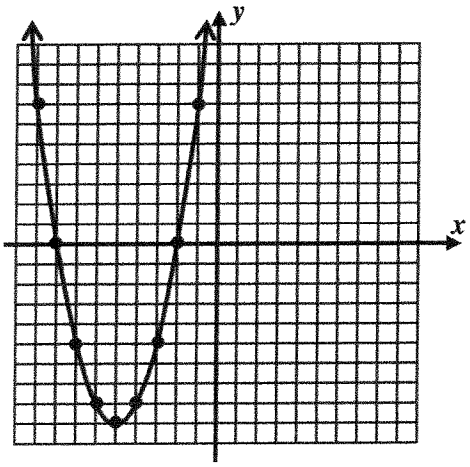


Zeros:

Factors:

Equation:

(b)



Zeros:

Factors:

Equation:

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Solving Incomplete Quadratic Equations
Algebra 1

An incomplete quadratic equation is one that can be expressed in the form $ax^2 + c = 0$. In other words, the linear term is missing from $ax^2 + bx + c = 0$. The Zero Product Law can be used to solve incomplete quadratic equations that are factorable, as illustrated by *Exercise* #1 below.

Exercise #1: Solve and check each of the following incomplete quadratic equations using the Zero Product Law.

(a) $x^2 - 9 = 0$ (b) $x^2 - 144 = 0$ (c) $x^2 - 49 = 0$

(d) $x^2 = 121$ (e) $2x^2 - 72 = 0$ (f) $3x^2 = 12$

Because incomplete quadratics lack the linear term, they may be solved faster by isolating x^2 and then applying the **inverse** of the squaring function - the **square root function.** This method works even in the case in which the incomplete quadratic is not factorable over the set of rational numbers; in other words, the zeros are irrational numbers. Working through *Exercises* #2 and #3 below will illustrate this process.

Exercise #2: Solve each of the given incomplete quadratic equations by taking square roots. Keep in mind that every positive number has **two** square roots, the principal root and its negative root.

(a) $x^2 - 81 = 0$ (b) $3x^2 - 108 = 0$ (c) $4x^2 = 100$