

# Norwalk High School

## SUMMER REVIEW ALGEBRA 2



This packet is to help you review the materials you should have learned in Algebra 1. These are skills that are essential in order to be successful in Algebra 2. It is expected that students entering Algebra 2 will have already mastered the concepts in this packet.

This packet is designed as a review and practice for you. There are notes and examples for each topic. Following the notes there are practice problems to complete. The answers for the problems are in the back of the packet. **On the first day of school you will be given a Test on all of these concepts.**

If you need additional help on any of these concepts search online. There are hundreds of sites with tutorials or examples of these materials. You can try [youtube.com](http://youtube.com) or [khanacademy.org](http://khanacademy.org).

It is required that all Algebra 2 students have a TI-83 or TI-84 graphing calculator.

# Algebra 1 Skills Needed to be Successful in Algebra 2

## A. Simplifying Expressions

Objectives: The student will be able to:

- Use the order of operations to evaluate an expression.
- Apply the appropriate arithmetic operations and algebraic properties needed to simplify an algebraic expression.
- Simplify polynomial expressions using addition and subtraction.
- Multiply a monomial and polynomial.

## B. Evaluating Functions

Objectives: The student will be able to:

- Substitute a value for  $x$  into an equation.
- Fill in a table of values by evaluating.
- Use a table of values to sketch a graph.

## C. Solving Equations

Objectives: The student will be able to:

- Solve multi-step equations.
- Solve a literal equation for a specific variable, and use formulas to solve problems.

## D. Rules of Exponents

Objectives: The student will be able to:

- Simplify expressions using the laws of exponents.
- Evaluate powers that have zero or negative exponents.

## E. Binomial Multiplication

Objectives: The student will be able to:

- Multiply two binomials.

## F. Graphing Lines

Objectives: The student will be able to:

- Identify and calculate the slope of a line.
- Graph linear equations using a variety of methods.
- Determine the equation of a line.

# A. Simplifying Expressions

## I. Order of Operations

“Please Excuse My Dear Aunt Sally”

Parentheses Exponents Multiplication Division Addition Subtraction

1. PARENTHESES – Perform operations inside any grouping symbols. These would include (parentheses),  $\sqrt{\text{radicals}}$ , |absolute values| and  $\frac{\text{fraction}}{\text{bars}}$ . If there are more than one of these work from the inside out.
2. EXPONENTS – Simplify exponents.
3. Perform Multiplication OR Division from LEFT to RIGHT.
4. Perform Addition OR Subtraction from LEFT to RIGHT.

Ex. 1:  $-4^2 + 24 \div 3 \cdot 2$  No ( ), exponents first. Note: you are squaring the 4 not -4  
 $-16 + 24 \div 3 \cdot 2$  Multiplication/Division from LEFT to RIGHT  
 $-16 + 8 \cdot 2$  Division came first. Now multiply.  
 $-16 + 16$  Addition  
0

Ex. 2:  $4(25 - (5 - 2)^2)$  Two ( ), work furthest inside first.  
 $4(25 - (3)^2)$  Exponent  
 $4(25 - 9)$  ( )  
 $4(16)$  Multiply  
64

Ex. 3:  $3 - 4(8 - 16 \div 4) + 5$  ( ), Division before Subtraction  
 $3 - 4(8 - 4) + 5$   
 $3 - 4(4) + 5$  Multiplication  
 $3 - 16 + 5$  Addition/Subtraction LEFT to RIGHT  
 $-13 + 5$   
-8

## II. Combining Like Terms

- You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Ex. 1:  $5x - 7y + 10x + 3y$   
 $5x - 7y + 10x + 3y$   
 $15x - 4y$

Ex. 2:  $-8h^2 + 10h^3 - 12h^2 - 15h^3$   
 $-8h^2 + 10h^3 - 12h^2 - 15h^3$   
 $-20h^2 - 5h^3$

### III. Applying the Distributive Property

- a. Every term inside the parentheses is multiplied by the term outside of the parentheses.

$$\begin{aligned} \text{Ex. 1: } & 3(9x - 4) \\ & 3 \cdot 9x - 3 \cdot 4 \\ & 27x - 12 \end{aligned}$$

$$\begin{aligned} \text{Ex. 2: } & 4x^2(5x^3 + 6x) \\ & 4x^2 \cdot 5x^3 + 4x^2 \cdot 6x \\ & 20x^5 + 24x^3 \end{aligned}$$

### IV. Combining Like Terms AND the Distributive Property (Problems with a Mix!)

- a. Sometimes problems will require you to distribute AND combine like terms!!

$$\begin{aligned} \text{Ex. 1: } & 3(4x - 2) + 13x \\ & 3 \cdot 4x - 3 \cdot 2 + 13x \\ & 12x - 6 + 13x \\ & 25x - 6 \end{aligned}$$

$$\begin{aligned} \text{Ex. 2: } & 3(12x - 5) - 9(-7 + 10x) \\ & 3 \cdot 12x - 3 \cdot 5 - 9(-7) - 9(10x) \\ & 36x - 15 + 63 - 90x \\ & -54x + 48 \end{aligned}$$

### PRACTICE SET 1

Simplify.

1.  $6 - 10 \div 5 + 3 \cdot 2$

2.  $2(7 + (3 - 5)^2) + 10$

3.  $-3^2 + 20 \div (5 - 3)^2$

4.  $\frac{5^2 - 1}{8 - (2)(2 + 1)}$

5.  $8x - 4y + 2x + 7y + 12$

6.  $5x + 10 + 3x^2 - 7x$

7.  $5n - (3 - 4n)$

8.  $-2(11b - 3)$

9.  $2x(3x + 4)$

10.  $-(5x - 6)$

11.  $x(2x - 2) - 3(2x^2 - 4)$

12.  $(5x^2 + 2x - 3) - (3x^2 - 5x + 4)$

## B. Evaluating Functions

### I. Evaluating by substitution

Any equation written " $f(x) =$ " means a function of  $x$ , where  $x$  is the variable. If you are asked to evaluate  $f(2)$  (read "f of 2"), you simply plug in 2 for  $x$  and solve.

Ex. 1:  $f(x) = 3x - 5$ , evaluate  $f(2)$       Substitute 2 in for all  $x$ 's.  
 $f(2) = 3(2) - 5$       Use Order of operations to Evaluate.  
 $6 - 5 = 1$   
 $f(2) = 1$

When you plug in a value for  $x$  the answer represents a  $y$ -value. Together they make a point on the graph of that function. In the example above the graph of  $f(x)$  goes through the point  $(2, 1)$ .

Ex. 2:  $f(x) = x^2 - 5$ , evaluate  $f(-3)$   
 $f(-3) = (-3)^2 - 5$   
 $f(-3) = 9 - 5$   
 $f(-3) = 4$

Ex. 3:  $f(x) = 2x^2 - 3x + 2$ , evaluate  $f(-2)$   
 $f(-2) = 2(-2)^2 - 3(-2) + 2$   
 $f(-2) = 2(4) + 6 + 2$   
 $f(-2) = 8 + 6 + 2$   
 $f(-2) = 16$

### II. Making a table of values

You can find the points on the graph of any equation by making a table of values. Evaluate (plug in) at an  $x$ -value and the answer is the  $y$ -value.

Ex. 1: Fill in the table of values for the function  $f(x) = -2x + 1$ .  
Use the table to sketch a graph of the line.

x	y
-2	
-1	
0	
1	
2	

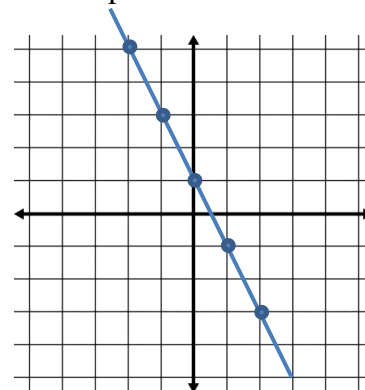
Plug in each  $x$ .

$$f(-2) = -2(-2) + 1 = 5$$
$$f(-1) = -2(-1) + 1 = 3$$
$$f(0) = -2(0) + 1 = 1$$
$$f(1) = -2(1) + 1 = -1$$
$$f(2) = -2(2) + 1 = -3$$

Filled in table.

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

Graph.



## PRACTICE SET 2

Evaluate.

1.  $f(x) = 7x - 10$ , Find  $f(2)$

2.  $f(x) = -3x + 2$ , Find  $f(-2)$

3.  $f(x) = x^2 - 5$ , Find  $f(4)$

4.  $f(x) = 2x^2 + 3$ , Find  $f(-1)$

5.  $f(x) = 2x - x^2$ , Find  $f(-3)$

6.  $f(x) = -2x + x^3 - 1$ , Find  $f(-2)$

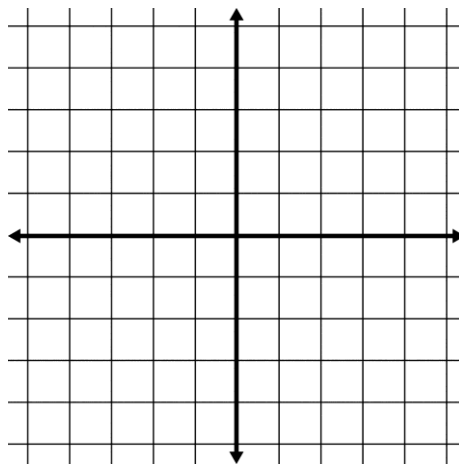
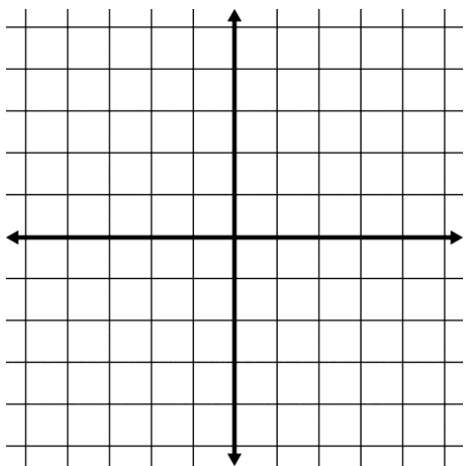
Fill in the table of values for the equation and then sketch a graph.

7.  $f(x) = 2x - 1$

x	y
-2	
-1	
0	
1	
2	

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

x	y
-2	
-1	
0	
1	
2	



## C. Solving Equations

### I. Solving Two-Step Equations

- A couple of hints:
1. To solve an equation, UNDO the order of operations and work in the reverse order.
  2. REMEMBER! Addition is “undone” by subtraction, and vice versa. Multiplication is “undone” by division, and vice versa.

$$\begin{aligned} \text{Ex. 1: } 4x - 2 &= 30 \\ + 2 \quad + 2 & \\ 4x &= 32 \\ \div 4 \quad \div 4 & \\ x &= 8 \end{aligned}$$

$$\begin{aligned} \text{Ex. 2: } 87 &= -11x + 21 \\ -21 \quad -21 & \\ 66 &= -11x \\ \div -11 \quad \div -11 & \\ -6 &= x \end{aligned}$$

### I. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

$$\begin{aligned} \text{Ex. 3: } 8x + 4 &= 4x + 28 \\ -4 \quad -4 & \\ 8x &= 4x + 24 \\ -4x \quad -4x & \\ 4x &= 24 \\ \div 4 \quad \div 4 & \\ x &= 6 \end{aligned}$$

### II. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

$$\begin{aligned} \text{Ex. 4: } 5(4x - 7) &= 8x + 45 + 2x \\ 20x - 35 &= 10x + 45 \\ -10x \quad -10x & \\ 10x - 35 &= 45 \\ + 35 \quad + 35 & \\ 10x &= 80 \\ \div 10 \quad \div 10 & \\ x &= 8 \end{aligned}$$

### PRACTICE SET 3

Solve each equation. You must show all work.

1.  $5x - 2 = 33$

2.  $-2 = 4x + 10$

3.  $2(3x - 4) = 10$

4.  $5x - 15 + 3x = -39$

5.  $5x + 2 = 7x - 6$

6.  $2(3x - 5) = 4x - 20$

## D. Rules of Exponents

Multiplication: Recall  $(x^m)(x^n) = x^{(m+n)}$       *Ex:*  $(3x^4)(4x^2) = (3 \cdot 4)(x^4 \cdot x^2) = 12x^6$

Division: Recall  $\frac{x^m}{x^n} = x^{(m-n)}$       *Ex:*  $\frac{42x^5}{-3x^3} = \left(\frac{42}{-3}\right)\left(\frac{x^5}{x^3}\right) = -14x^2$

Powers: Recall  $(x^m)^n = x^{(m \cdot n)}$       *Ex:*  $(-2x^3)^3 = (-2)^3(x^3)^3 = -8x^9$

Power of Zero: Recall  $x^0 = 1, x \neq 0$       *Ex:*  $5x^0 = (5)(1) = 5$

### **PRACTICE SET 4**

Simplify each expression.

1.  $(x^5)(x)(x^2)$

2.  $\frac{x^{15}}{x^3}$

3.  $(x^4)^5$

4.  $x^0$

5.  $(x^4y^2)(x^7y^5)$

6.  $\frac{45x^3y^{10}}{5x^3y}$

7.  $(4x^5y^3)(15x^2y^3)$

8.  $(3x^2y)^4$

9.  $(12x^2y)^0$

10.  $2x(x^2 - 4x^3)$

11.  $x^2(x^3 + 5x - 2)$



## E. Binomial Multiplication

### I. Reviewing the Distributive Property

The distributive property is used when you want to multiply a single term by an expression.

$$\text{Ex 1: } 8(5x^2 - 9x)$$

$$8 \cdot 5x^2 + 8 \cdot (-9x)$$

$$40x^2 - 72x$$

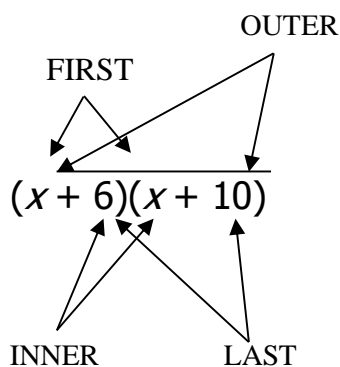
### II. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with two terms), we use the “FOIL” method. The “FOIL” method uses the distributive property twice!

FOIL is the order in which you will multiply your terms.

First  
Outer  
Inner  
Last

$$\text{Ex. 1: } (x + 6)(x + 10)$$



First	$x \cdot x \text{ -----} \rightarrow x^2$
Outer	$x \cdot 10 \text{ -----} \rightarrow 10x$
Inner	$6 \cdot x \text{ -----} \rightarrow 6x$
Last	$6 \cdot 10 \text{ -----} \rightarrow 60$

$$x^2 + 10x + 6x + 60$$

$$x^2 + 16x + 60$$

Recall:  $4^2 = 4 \cdot 4$ , so  $(x + 5)^2 \rightarrow (x + 5)(x + 5)$

**PRACTICE SET 5** – Multiply. Write your answer in simplest form.

1.  $(x + 5)(x + 2)$

2.  $(x + 7)(x - 2)$

3.  $(x - 3)(x - 4)$

4.  $(x - 9)(x + 1)$

5.  $(2x - 1)(4x + 3)$

6.  $(x + 4)^2$

## F. Graphing Lines

### I. Finding the Slope of the Line that Contains each Pair of Points.

Given two points with coordinates  $(x_1, y_1)$  and  $(x_2, y_2)$ , the formula for the slope,  $m$ , of the line through these points is  $m = \frac{y_2 - y_1}{x_2 - x_1}$ .

Ex. (2, 5) and (4, 1)

$$m = \frac{1-5}{4-2} = \frac{-4}{2} = -2$$

The slope is -2.

Ex. (-3, -1) and (2, 3)

$$m = \frac{3-(-1)}{2-(-3)} = \frac{4}{5}$$

The slope is 4/5.

### PRACTICE SET 6

1. (-1, 4) and (1, -2)

2. (3, 5) and (-3, 1)

3. (1, -3) and (-1, -2)

4. (2, -4) and (6, -4)

5. (2, 1) and (-2, -3)

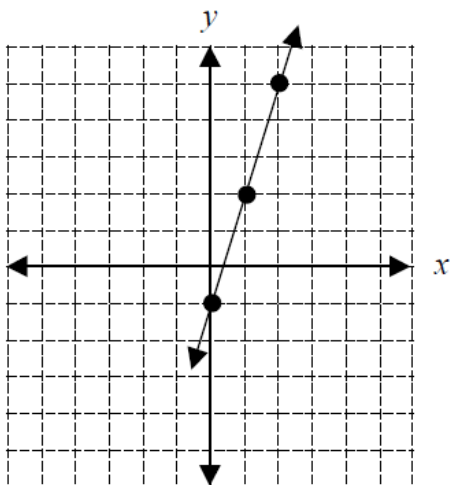
6. (5, -2) and (5, 7)

### II. Using the Slope – Intercept Form of the Equation of a Line.

The slope-intercept form for the equation of a line with slope  $m$  and  $y$ -intercept  $b$  is  $y = mx + b$ .

Ex.  $y = 3x - 1$

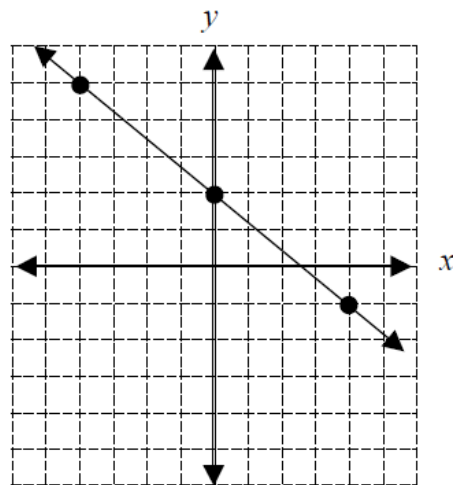
Slope: 3       $y$ -intercept: -1



Place a point on the  $y$ -axis at -1.  
Slope is 3 or 3/1, so travel up 3 on the  $y$ -axis and over 1 to the right.

Ex.  $y = -\frac{3}{4}x + 2$

Slope:  $-\frac{3}{4}$        $y$ -intercept: 2

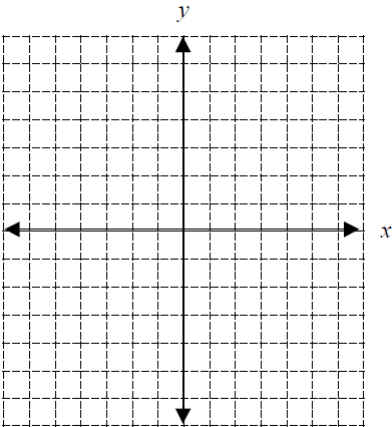


Place a point on the  $y$ -axis at 2.  
Slope is  $-3/4$  so travel down 3 on the  $y$ -axis and over 4 to the right. Or travel up 3 on the  $y$ -axis and over 4 to the left.

**PRACTICE SET 7**

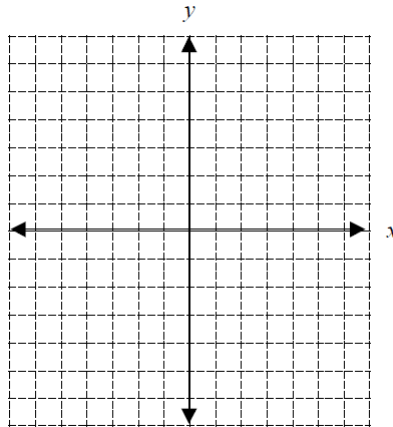
1.  $y = 2x + 5$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



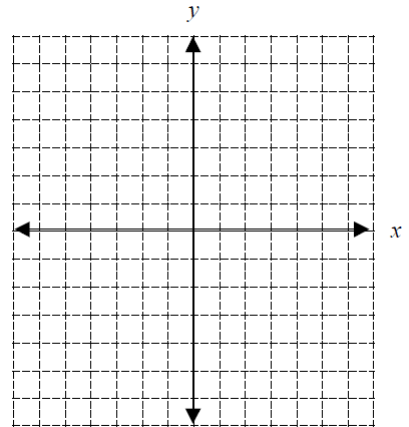
2.  $y = \frac{1}{2}x - 3$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



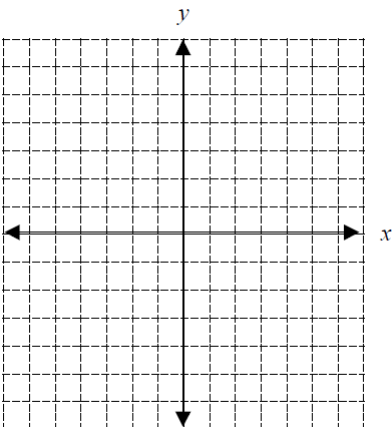
3.  $y = -\frac{2}{5}x + 4$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



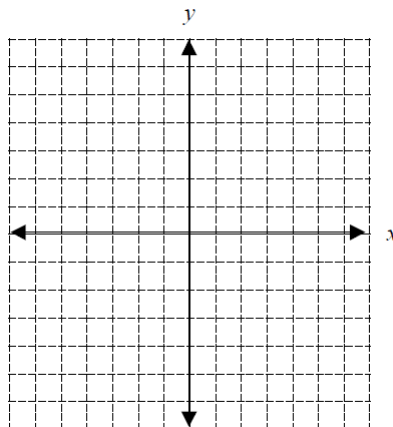
4.  $y = -3x$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



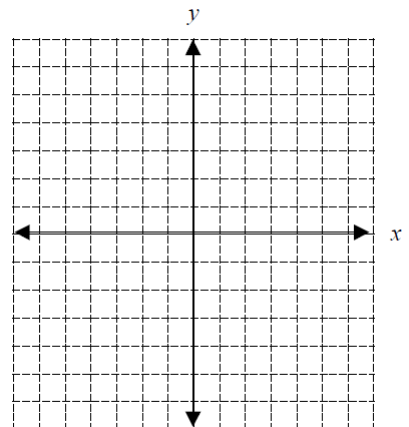
5.  $y = -x + 2$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



3.  $y = x$

Slope: \_\_\_\_\_ y-int: \_\_\_\_\_



## Using Standard Form to Graph a Line.

An equation in standard form can be graphed using several different methods. Two methods are explained below.

- Re-write the equation in  $y = mx + b$  form, identify the  $y$ -intercept and slope, then graph as in Part II above.
- Solve for the  $x$ - and  $y$ - intercepts. To find the  $x$ -intercept, let  $y = 0$  and solve for  $x$ . To find the  $y$ -intercept, let  $x = 0$  and solve for  $y$ . Then plot these points on the appropriate axes and connect them with a line.

Ex.  $2x - 3y = 10$

- a. Solve for  $y$ .

$$-3y = -2x + 10$$

$$y = \frac{-2x + 10}{-3}$$

$$y = \frac{2}{3}x - \frac{10}{3}$$

OR

- b. Find the intercepts:

let  $y = 0$  :

$$2x - 3(0) = 10$$

$$2x = 10$$

$$x = 5$$

let  $x = 0$ :

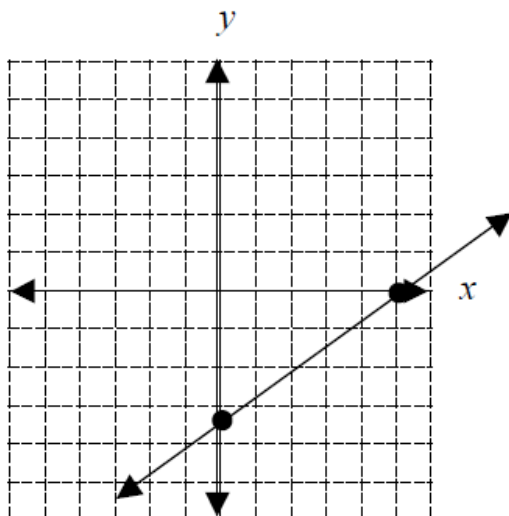
$$2(0) - 3y = 10$$

$$-3y = 10$$

$$y = -\frac{10}{3}$$

The  $x$ -intercept is  $(5, 0)$

The  $y$ -intercept is  $(0, -\frac{10}{3})$



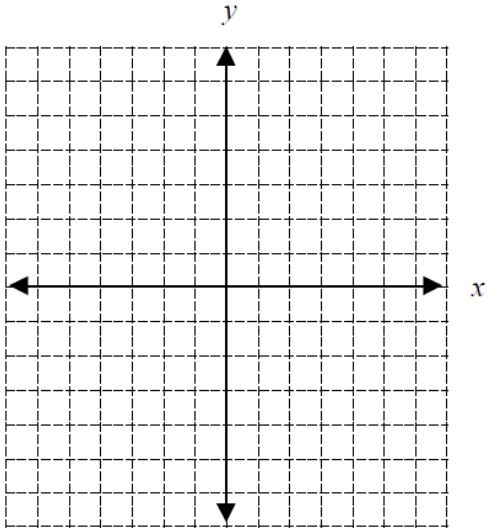
On the  $x$ -axis place a point at 5.

On the  $y$ -axis place a point at  $-\frac{10}{3} = -3\frac{1}{3}$

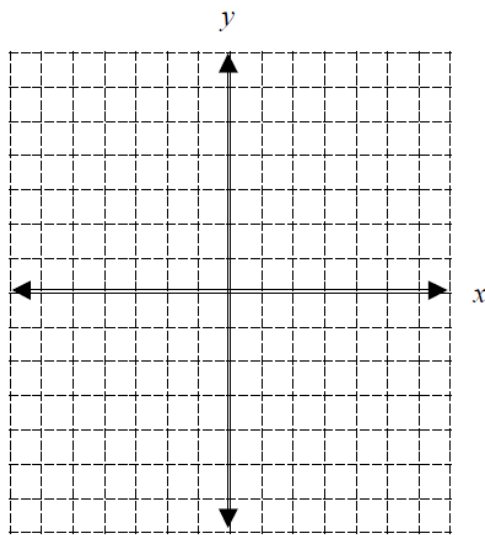
Connect the points with the line.

**PRACTICE SET 8**

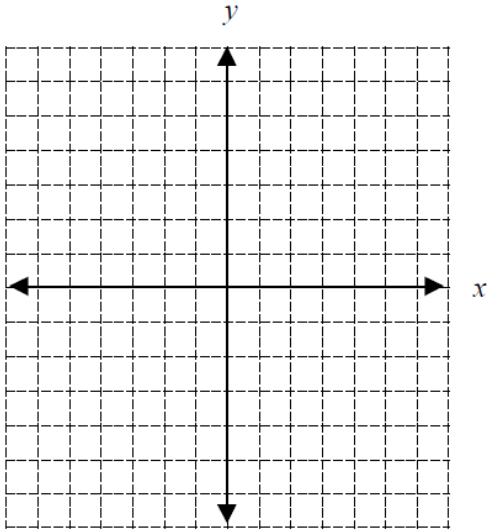
1.  $3x + y = 3$



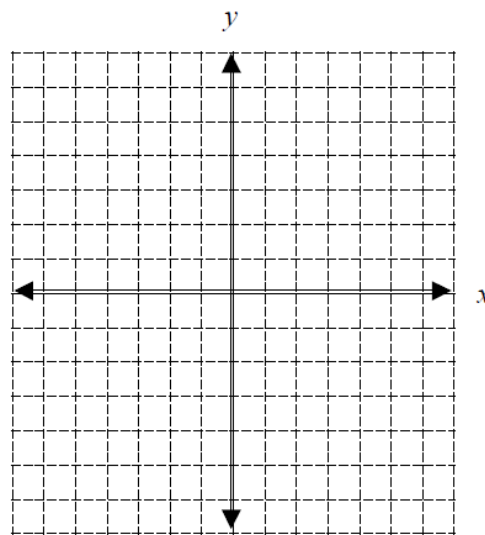
2.  $5x + 2y = 10$



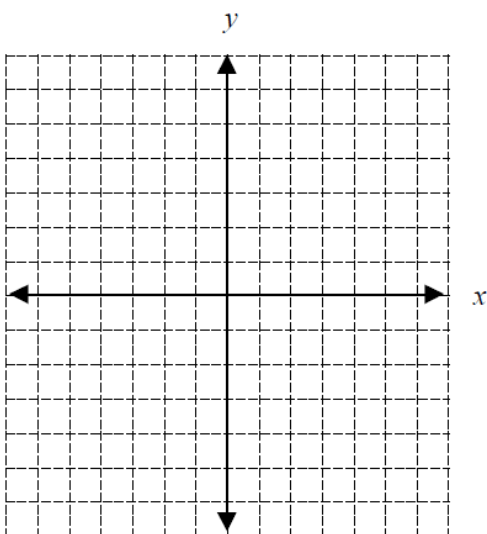
3.  $y = 4$



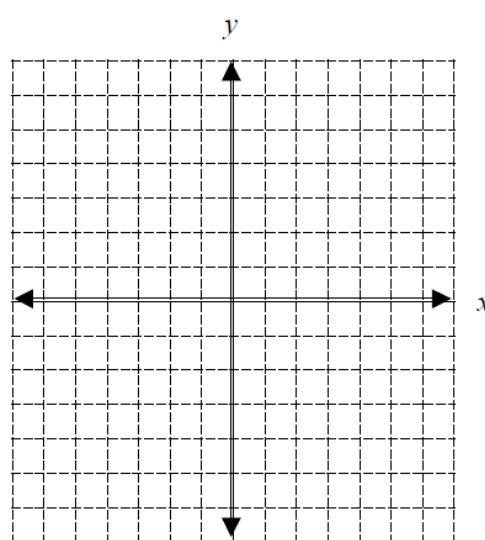
4.  $4x - 3y = 9$



5.  $-2x + 6y = 12$



6.  $x = -3$



# Algebra 2 Summer Review Packet Student Answer Key

## A. Simplifying Polynomial Expressions

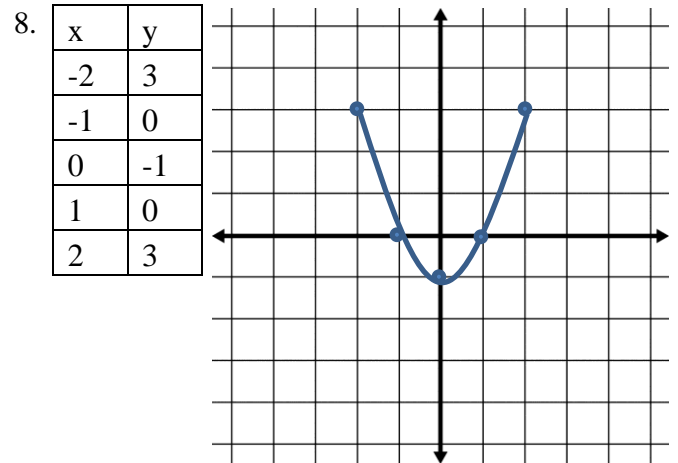
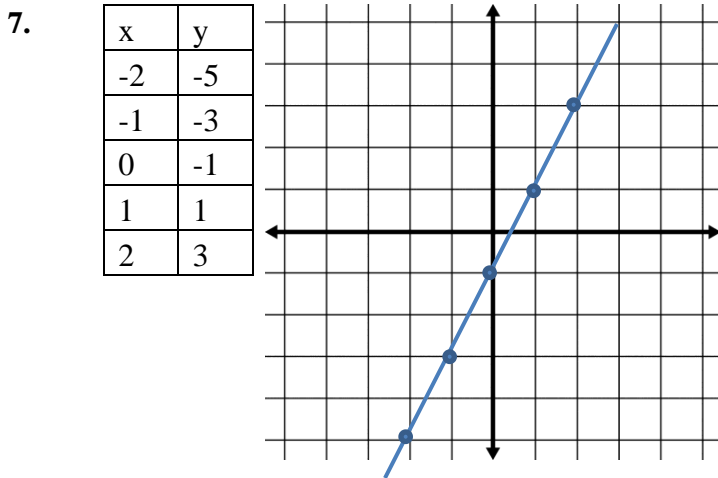
### PRACTICE SET 1

1. 10                      2. 32                      3. -4                      4. 12  
5.  $10x + 3y + 12$       6.  $3x^2 - 2x + 10$       7.  $9n - 3$                       8.  $-22b + 6$   
9.  $6x^2 + 8x$               10.  $-5x + 6$               11.  $-4x^2 - 2x + 12$       12.  $2x^2 + 7x - 7$

## B. Evaluating Functions

### PRACTICE SET 2

1.  $f(2)=4$       2.  $f(-2)=8$       3.  $f(4)=11$       4.  $f(-1)=5$       5.  $f(-3)=-15$       6.  $f(-2)=-5$



## C. Solving Equations

### PRACTICE SET 3

1.  $x = 7$                       2.  $x = -3$                       3.  $x = 3$   
4.  $x = -3$                       5.  $x = 4$                       6.  $x = -5$

## D. Rules of Exponents

### PRACTICE SET 4

1.  $x^8$                       2.  $x^{12}$                       3.  $x^{20}$                       4. 1  
5.  $x^{11}y^7$                       6.  $9x^9$                       7.  $60x^8y^5$                       8.  $81x^8y^4$   
9. 1                      10.  $2x^3 - 8x^4$                       11.  $x^5 + 5x^3 - 2x^2$

## E. Binomial Multiplication

### PRACTICE SET 5

1.  $x^2 + 7x + 10$

2.  $x^2 + 5x - 14$

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

4.  $x^2 - 8x - 9$

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

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

## F. Graphing Lines

### PRACTICE SET 6

1. -3

2.  $\frac{2}{3}$

3.  $-\frac{1}{2}$

4. 0

5. 1

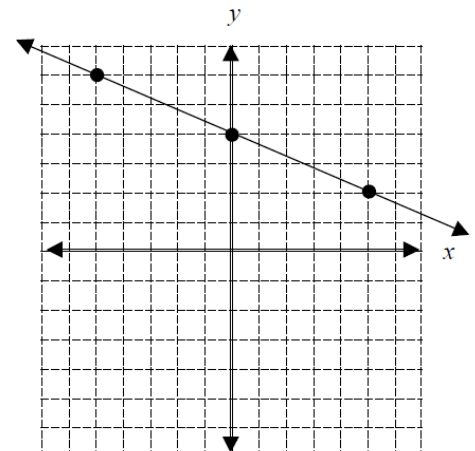
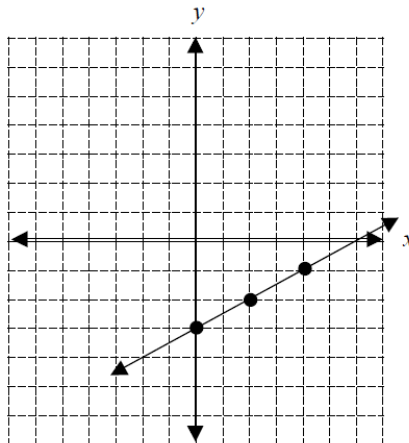
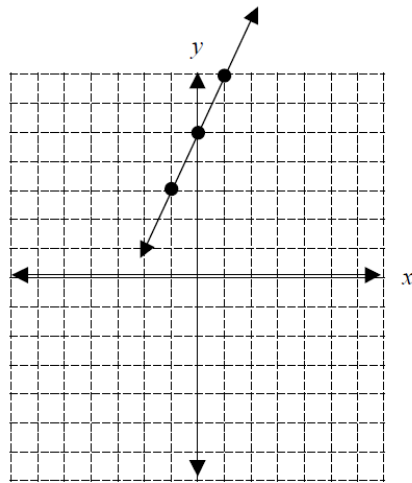
6. Undefined (vertical line)

### PRACTICE SET 7

1. Slope: 2 y-int: 5

2. Slope:  $\frac{1}{2}$  y-int: -3

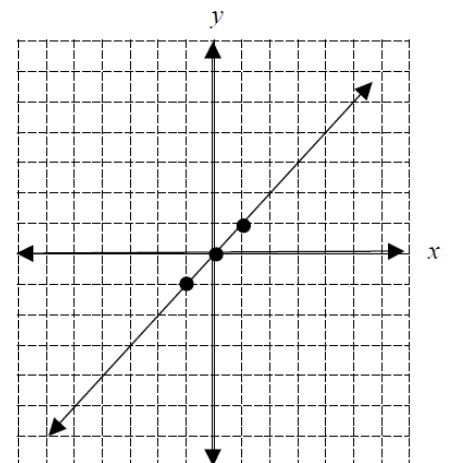
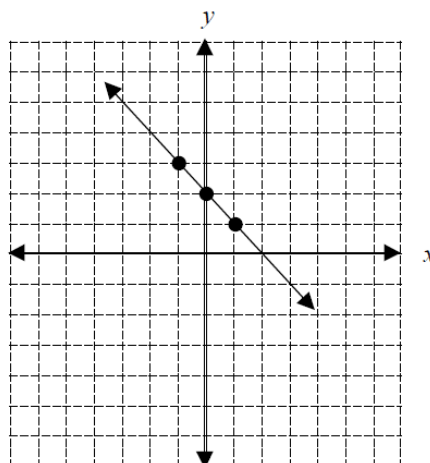
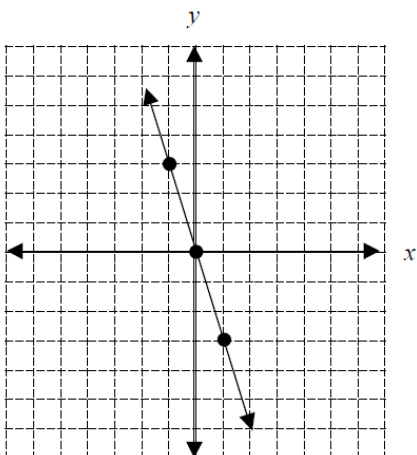
3. Slope:  $-\frac{2}{5}$  y-int: 4



4. Slope: -3 y-int: 0

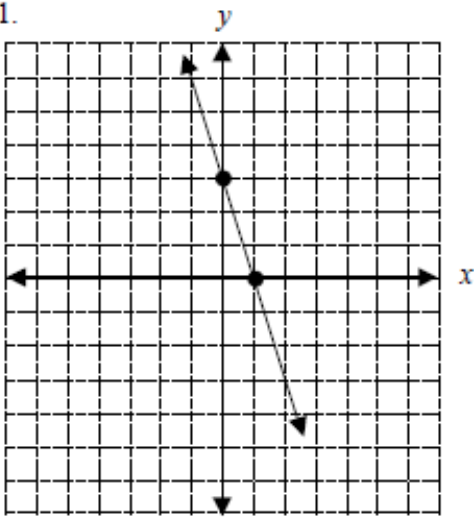
5. Slope: -1 y-int: 2

6. Slope: 1 y-int: 0

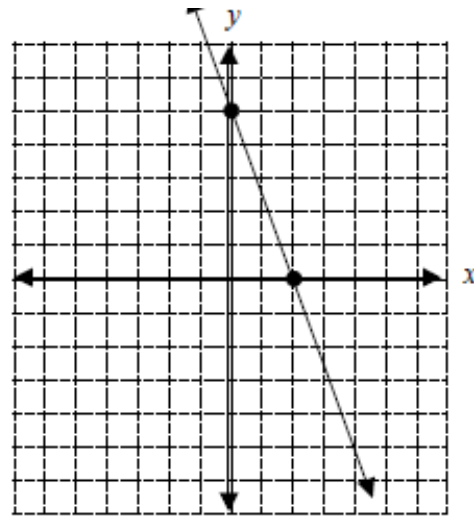


**PRACTICE SET 8**

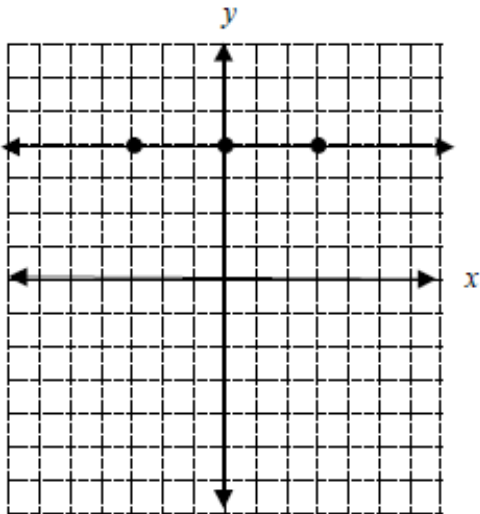
1.



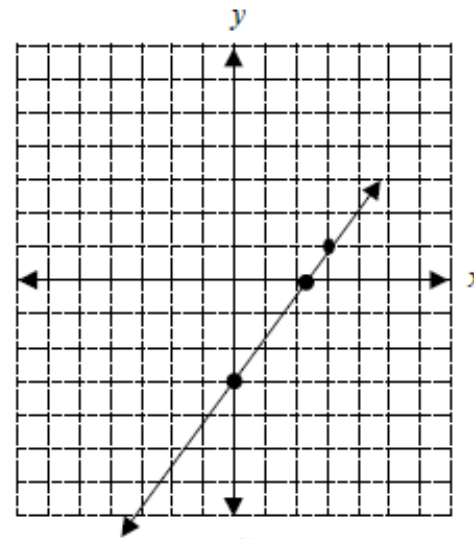
2.



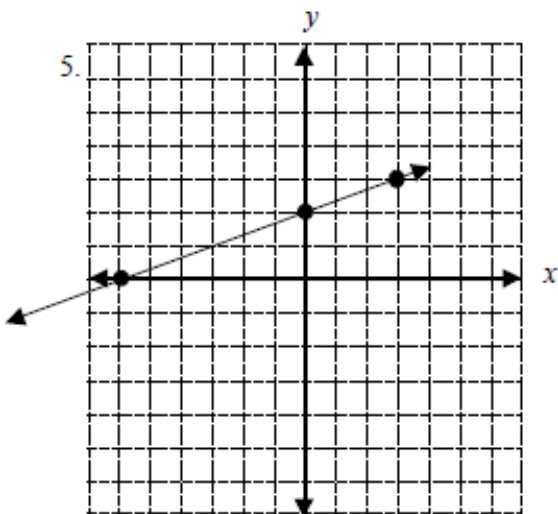
3.



4.



5.



6.

