FOR ALL STUDENTS TAKING COMMON CORE ALGEBRA II

2018-2019 SUMMER REVIEW PACKET

CCHS MATH DEPARTMENT

Dear Student and Parent/Guardian,

The math department at Catholic Central High school wants you to be successful in CC Algebra II. This summer packet is designed to help you review necessary skills. Be sure to follow the key information below when completing this packet:

- The packet is due when you return to school in September.
- **Every problem must be completed. None left blank.**
- The packet is worth 10 times a regular homework grade.
- Work must be shown to receive credit – no work, no points. Show the work on the packet pages. Do NOT add additional pages.
- Final answers must be shown on the answer pages at the back of the packet.
- A quiz covering the material from the packet may be given at the end of the first week of school. These topics also tie in with the first few units of CC Algebra II
- All topics covered in the packet should be completed without the aid of a calculator. If it is decided to give a quiz on the summer packets, no calculator will be allowed on the quiz.
- When you return in September, you will have an opportunity to ask questions. Math help will also be available during the first week.

We hope that you have an enjoyable summer and return to school ready to be successful in CC Algebra II.

Algebra 1 Skills Needed to be Successful in Algebra 2

A. Simplifying Polynomial Expressions

Objectives: The student will be able to:

- 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. 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.

C. 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.

D. Binomial Multiplication

Objectives: The student will be able to:

- Multiply two binomials.

E. Factoring

Objectives: The student will be able to:

- Identify the greatest common factor of the terms of a polynomial expression.
- Express a polynomial as a product of a monomial and a polynomial.
- Find all factors of the quadratic expression $ax^2 + bx + c$ by factoring and graphing.

F. Radicals

Objectives: The student will be able to:

- Simplify radical expressions.

G. 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.

H. Regression and Use of the Graphing Calculator

Objectives: The student will be able to:

- Draw a scatter plot, find the line of best fit, and use it to make predictions.
- Graph and interpret real-world situations using linear models.

A. Simplifying Polynomial Expressions

I. 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: $5x - 7y + 10x + 3y$

$\underline{5x}\ \underline{-7y} + \underline{10x} + \underline{3y}$

$15x - 4y$

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

$\underline{-8h^2} + \underline{10h^3}\ \underline{-12h^2}\ \underline{-15h^3}$

$-20h^2 - 5h^3$

II. Applying the Distributive Property

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

Ex. 1: $3(9x-4)$

$3 \cdot 9x - 3 \cdot 4$

$27x - 12$

Ex. 2: $4x^2(5x^3 + 6x)$

$4x^2 \cdot 5x^3 + 4x^2 \cdot 6x$

$20x^5 + 24x^3$

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

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

Ex. 1: $3(4x-2) + 13x$

$3 \cdot 4x - 3 \cdot 2 + 13x$

$12x - 6 + 13x$

$25x - 6$

Ex. 2: $3(12x-5) - 9(-7+10x)$

$3 \cdot 12x - 3 \cdot 5 - 9(-7) - 9(10x)$

$36x - 15 + 63 - 90x$

$-54x + 48$

PRACTICE SET 1

Simplify.

1. $8x - 9y + 16x + 12y$

2. $14y + 22 - 15y^2 + 23y$

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

4. $-2(11b - 3)$

5. $10q(16x + 11)$

6. $-(5x - 6)$

7. $3(18z - 4w) + 2(10z - 6w)$

8. $(8c + 3) + 12(4c - 10)$

9. $9(6x - 2) - 3(9x^2 - 3)$

10. $-(y - x) + 6(5x + 7)$

B. 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.

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

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

II. 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.

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

III. 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.

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

PRACTICE SET 2

Solve each equation. You must show all work.

1. $5x - 2 = 33$

2. $140 = 4x + 36$

3. $8(3x - 4) = 196$

4. $45x - 720 + 15x = 60$

5. $132 = 4(12x - 9)$

6. $198 = 154 + 7x - 68$

7. $-131 = -5(3x - 8) + 6x$

8. $-7x - 10 = 18 + 3x$

9. $12x + 8 - 15 = -2(3x - 82)$

10. $-(12x - 6) = 12x + 6$

IV. Solving Literal Equations

- A literal equation is an equation that contains more than one variable.
- You can solve a literal equation for one of the variables by getting that variable by itself (isolating the specified variable).

$Ex. 1:\ 3xy = 18,\quad \text{Solve for } x.$

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

$Ex. 2:\ 5a - 10b = 20,\quad \text{Solve for } a.$

$$+10b = +10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

PRACTICE SET 3

Solve each equation for the specified variable.

1. $Y + V = W$, for V

2. $9wr = 81$, for w

3. $2d - 3f = 9$, for f

4. $dx + t = 10$, for x

5. $P = (g - 9)180$, for g

6. $4x + y - 5h = 10y + u$, for x

C. Rules of Exponents

Multiplication: Recall $(x^m)(x^n) = x^{(m+n)}$ *Ex*: $(3x^4y^2)(4xy^5) = (3 \cdot 4)(x^4 \cdot x^1)(y^2 \cdot y^5) = 12x^5y^7$

Division: Recall $\dfrac{x^m}{x^n} = x^{(m-n)}$ *Ex*: $\dfrac{42m^5j^2}{-3m^3j} = \left(\dfrac{42}{-3}\right)\left(\dfrac{m^5}{m^3}\right)\left(\dfrac{j^2}{j^1}\right) = -14m^2j$

Powers: Recall $(x^m)^n = x^{(m \cdot n)}$ *Ex*: $(-2a^3bc^4)^3 = (-2)^3(a^3)^3(b^1)^3(c^4)^3 = -8a^9b^3c^{12}$

Power of Zero: Recall $x^0 = 1,\ x \neq 0$ *Ex*: $5x^0y^4 = (5)(1)(y^4) = 5y^4$

PRACTICE SET 4

Simplify each expression.

1. $(c^5)(c)(c^2)$
2. $\dfrac{m^{15}}{m^3}$
3. $(k^4)^5$
4. d^0
5. $(p^4q^2)(p^7q^5)$
6. $\dfrac{45y^3z^{10}}{5y^3z}$
7. $(-t^7)^3$
8. $3f^3g^0$
9. $(4h^5k^3)(15k^2h^3)$
10. $\dfrac{12a^4b^6}{36ab^2c}$
11. $(3m^2n)^4$
12. $(12x^2y)^0$
13. $(-5a^2b)(2ab^2c)(-3b)$
14. $4x(2x^2y)^0$
15. $(3x^4y)(2y^2)^3$

D. Binomial Multiplication

I. Reviewing the Distributive Property

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

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 <u>two</u> terms), we use the "FOIL" method. The "FOIL" method uses the distributive property <u>twice</u>!

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

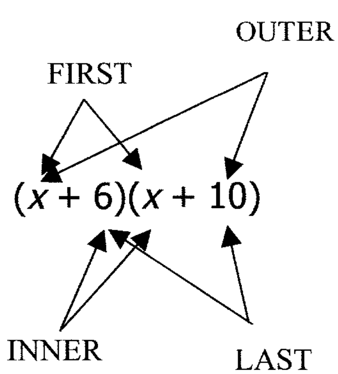
First

Outer

Inner

Last

Ex. 1: (x + 6)(x + 10)



First	$x \cdot x$ ------> x^2
Outer	$x \cdot 10$ -----> $10x$
Inner	$6 \cdot x$ ------> $6x$
Last	$6 \cdot 10$ -----> 60

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

$x^2 + 16x + 60$

(After combining like terms)

Recall: $4^2 = 4 \cdot 4$

$x^2 = x \cdot x$

Ex. $(x + 5)^2$

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

Now you can use the "FOIL" method to get a simplified expression.

PRACTICE SET 5

Multiply. Write your answer in simplest form.

1. $(x + 10)(x - 9)$
2. $(x + 7)(x - 12)$
3. $(x - 10)(x - 2)$
4. $(x - 8)(x + 81)$
5. $(2x - 1)(4x + 3)$
6. $(-2x + 10)(-9x + 5)$
7. $(-3x - 4)(2x + 4)$
8. $(x + 10)^2$
9. $(-x + 5)^2$
10. $(2x - 3)^2$

E. Factoring

I. Using the Greatest Common Factor (GCF) to Factor.

- Always determine whether there is a greatest common factor (GCF) first.

Ex. 1 $3x^4 - 33x^3 + 90x^2$

- In this example the GCF is $3x^2$.
- So when we factor, we have $3x^2(x^2 - 11x + 30)$.
- Now we need to look at the polynomial remaining in the parentheses. Can this trinomial be factored into two binomials? In order to determine this make a list of all of the factors of 30.

30			30	
1	30		-1	-30
2	15		-2	-15
3	10		-3	-10
5	6		-5	-6

Since -5 + -6 = -11 and (-5)(-6) = 30 we should choose -5 and -6 in order to factor the expression.

- The expression factors into $3x^2(x-5)(x-6)$

Note: Not all expressions will have a GCF. If a trinomial expression does not have a GCF, proceed by trying to factor the trinomial into two binomials.

II. Applying the difference of squares: $a^2 - b^2 = (a-b)(a+b)$

Ex. 2 $4x^3 - 100x$

$4x(x^2 - 25)$

$4x(x-5)(x+5)$

Since x^2 and 25 are perfect squares separated by a subtraction sign, you can apply the difference of two squares formula.

PRACTICE SET 6

Factor each expression.

1. $3x^2 + 6x$

2. $4a^2b^2 - 16ab^3 + 8ab^2c$

3. $x^2 - 25$

4. $n^2 + 8n + 15$

5. $g^2 - 9g + 20$

6. $d^2 + 3d - 28$

7. $z^2 - 7z - 30$

8. $m^2 + 18m + 81$

9. $4y^3 - 36y$

10. $5k^2 + 30k - 135$

F. Radicals

To simplify a radical, we need to find the greatest perfect square factor of the number under the radical sign (the radicand) and then take the square root of that number.

$Ex. 1: \sqrt{72}$

$\sqrt{36} \cdot \sqrt{2}$

$6\sqrt{2}$

$Ex. 2: 4\sqrt{90}$

$4 \cdot \sqrt{9} \cdot \sqrt{10}$

$4 \cdot 3 \cdot \sqrt{10}$

$12\sqrt{10}$

$Ex. 3: \sqrt{48}$

$\sqrt{16}\sqrt{3}$

$4\sqrt{3}$

OR

$Ex. 3: \sqrt{48}$

$\sqrt{4}\sqrt{12}$

$2\sqrt{12}$ ← This is not simplified completely because 12 is divisible by 4 (another perfect square)

$2\sqrt{4}\sqrt{3}$

$2 \cdot 2 \cdot \sqrt{3}$

$4\sqrt{3}$

PRACTICE SET 7

Simplify each radical.

1. $\sqrt{121}$
2. $\sqrt{90}$
3. $\sqrt{175}$
4. $\sqrt{288}$
5. $\sqrt{486}$
6. $2\sqrt{16}$
7. $6\sqrt{500}$
8. $3\sqrt{147}$
9. $8\sqrt{475}$
10. $\sqrt{\frac{125}{9}}$

G. 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 containing the points is $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.

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

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

The slope is -2.

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

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

The slope is $\frac{1}{5}$

<u>PRACTICE SET 8</u>

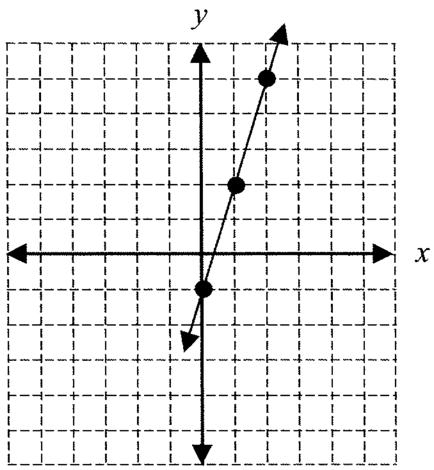
1. (-1, 4) and (1, -2)
2. (3, 5) and (-3, 1)
3. (1, -3) and (-1, -2)
4. (2, -4) and (6, -4)
5. (2, 1) and (-2, -3)
6. (5, -2) and (5, 7)

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. $y = 3x - 1$

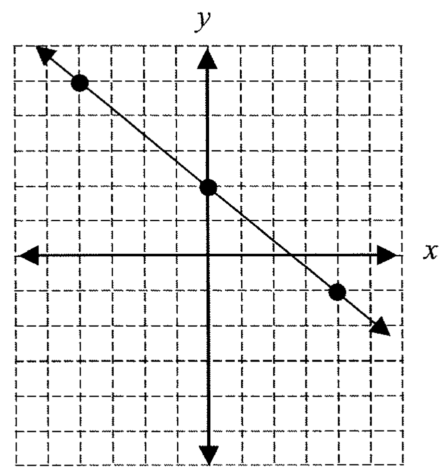
Slope: 3 y-intercept: -1



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

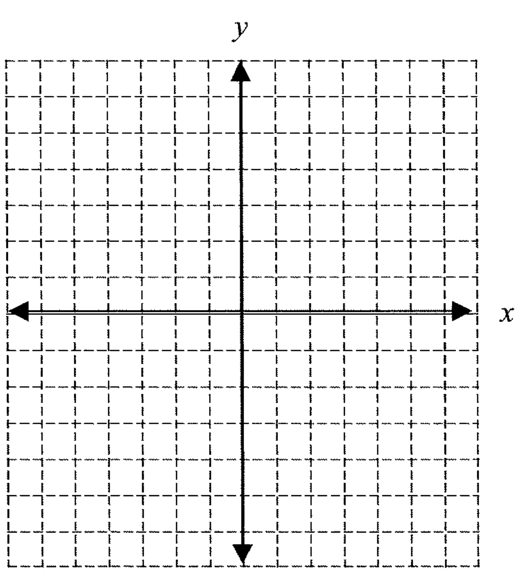


Place a point on the y-axis at 2. Slope is -3/4 so travel down 3 on the y-axis and over 4 to the right. Or travel up 3 on the y-axis and over 4 to the left.

PRACTICE SET 9

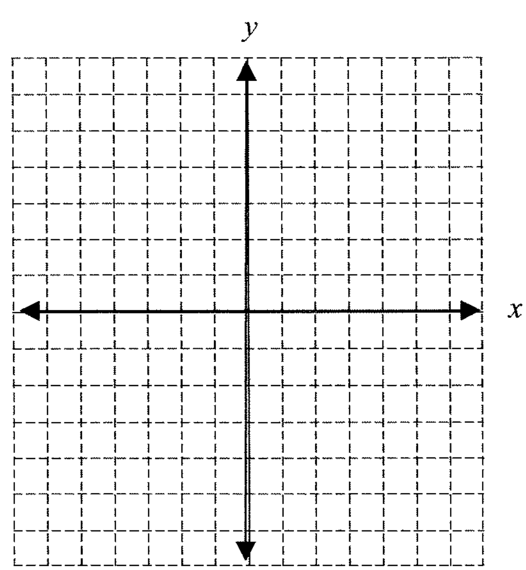
1. $y = 2x + 5$

Slope: _____ y-intercept: _____



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

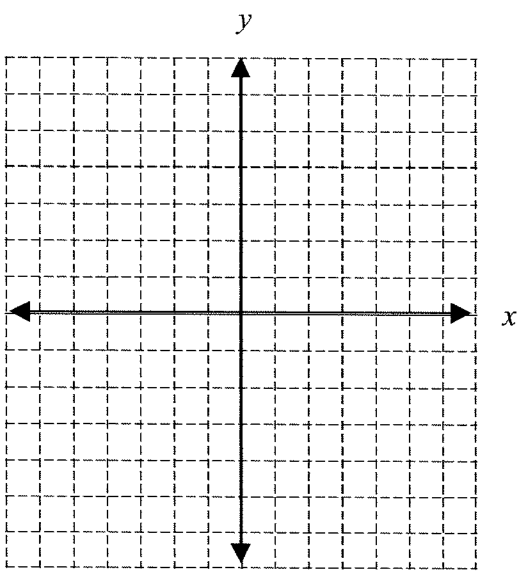
Slope: _____ y-intercept: _____



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

Slope: _______________

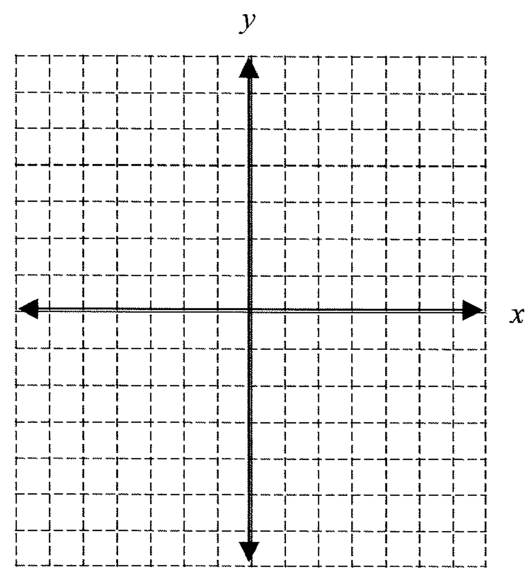
y-intercept: _______________



4. $y = -3x$

Slope: _______________

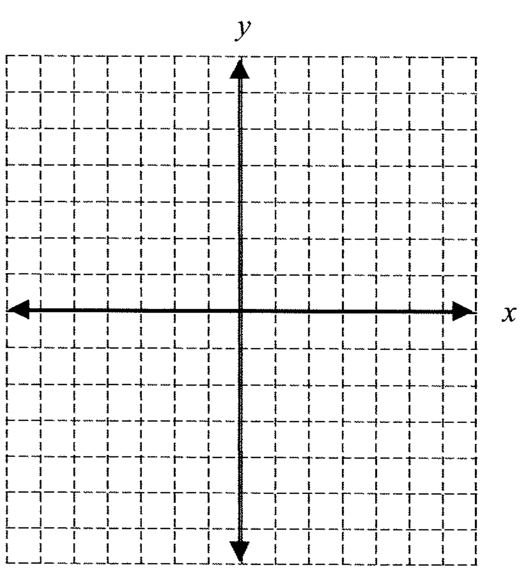
y-intercept _______________



5. $y = -x + 2$

Slope: _______________

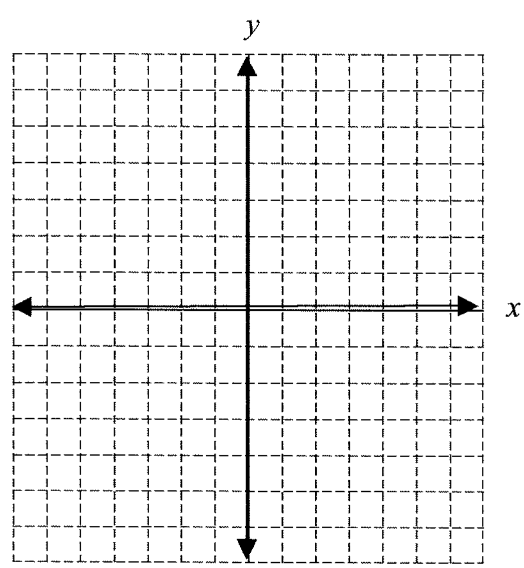
y-intercept: _______________



6. $y = x$

Slope: _______________

y-intercept _______________



III. Using Standard Form to Graph a Line.

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

a. Re-write the equation in $y = mx + b$ form, identify the y-intercept and slope, then graph as in Part II above.

b. 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 $y = 0$:

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

$$2x = 10$$

$$x = 5$$

So x-intercept is (5, 0)

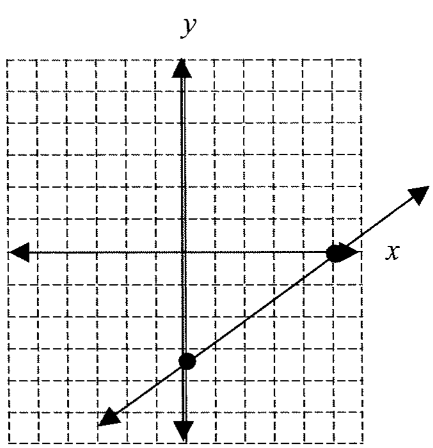
let $x = 0$:

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

$$-3y = 10$$

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

So y-intercept is $\left(0, -\frac{10}{3}\right)$



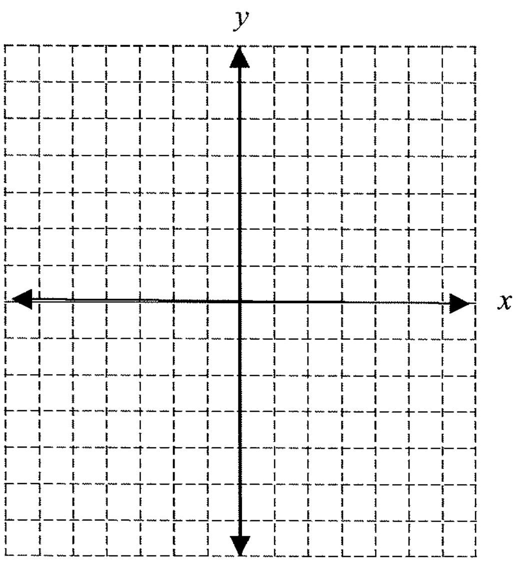
On the x-axis place a point at 5.

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

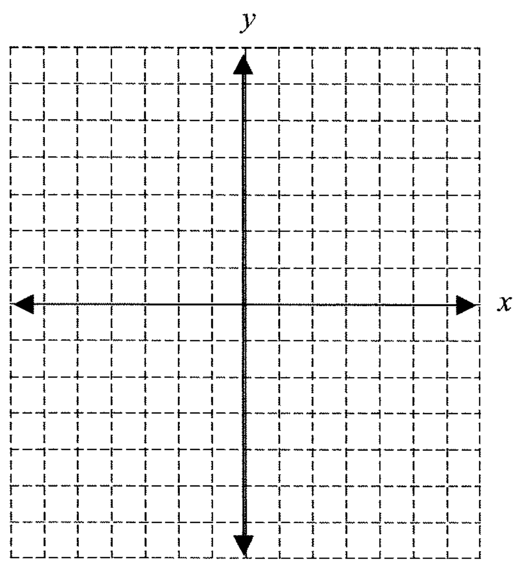
Connect the points with the line.

PRACTICE SET 10

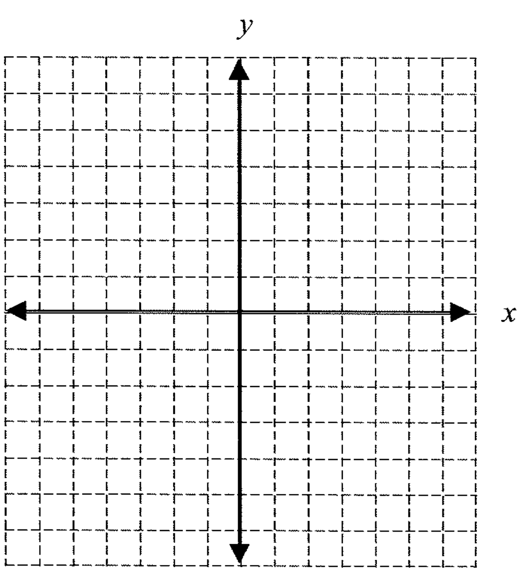
1. $3x + y = 3$



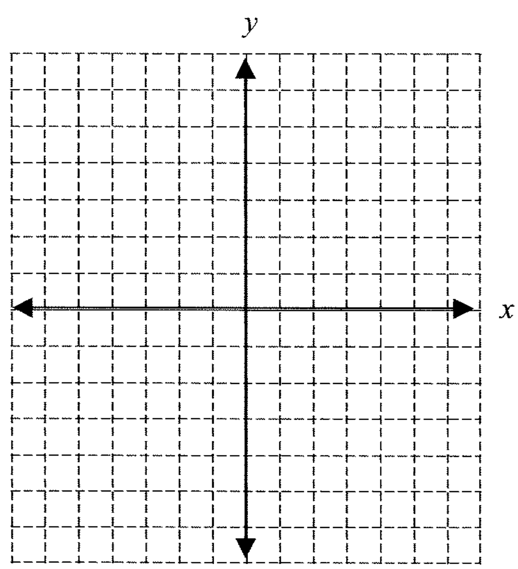
2. $5x + 2y = 10$



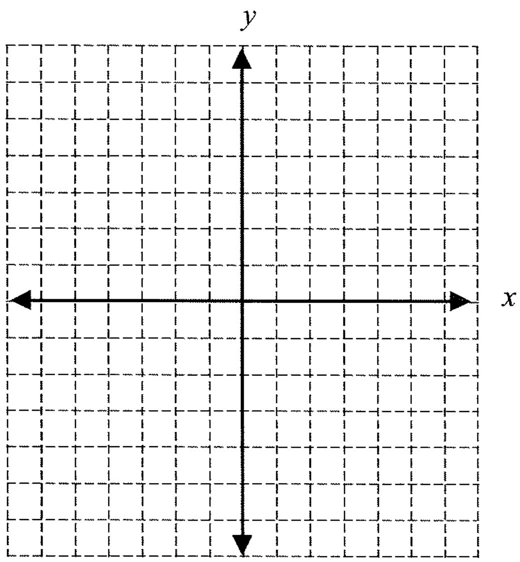
3. $y = 4$



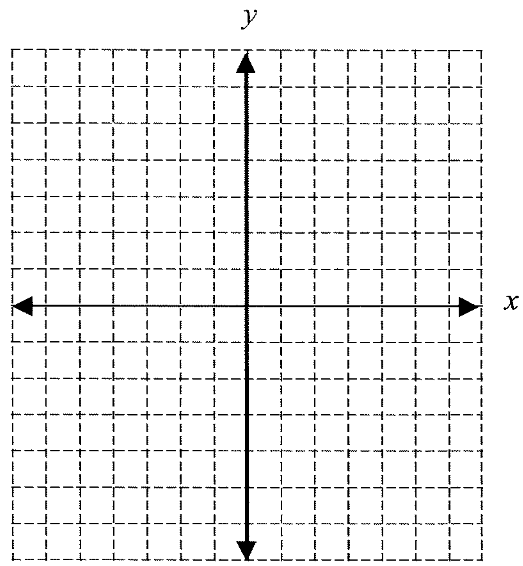
4. $4x - 3y = 9$



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



6. $x = -3$



Mixed Review

Name: ______________________________ **Date:** ________________

1. Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests, T, are left in the semester?

A. $\frac{255+93T}{3T}=90$ B. $\frac{255+90T}{3T}=93$

C. $\frac{255+93T}{T+3}=90$ D. $\frac{255+90T}{T+3}=93$

2. The solution set for the equation $\sqrt{56-x}=x$ is

A. $\{-8, 7\}$ B. $\{-7, 8\}$

C. $\{7\}$ D. $\{\}$

3. If $g(c)=1-c^2$ and $m(c)=c+1$, then which statement is *not* true?

A. $g(c)\cdot m(c)=1+c-c^2-c^3$

B. $g(c)+m(c)=2+c-c^2$

C. $m(c)-g(c)=c+c^2$

D. $\frac{m(c)}{g(c)}=\frac{-1}{1-c}$

4. Which function represents exponential decay?

A. $y=2^{0.3t}$ B. $y=1.2^{3t}$

C. $y=\left(\frac{1}{2}\right)^{-t}$ D. $y=5^{-t}$

5. The equation $4x^2-24x+4y^2+72y=76$ is equivalent to

A. $4(x-3)^2+4(y+9)^2=76$

B. $4(x-3)^2+4(y+9)^2=121$

C. $4(x-3)^2+4(y+9)^2=166$

D. $4(x-3)^2+4(y+9)^2=436$

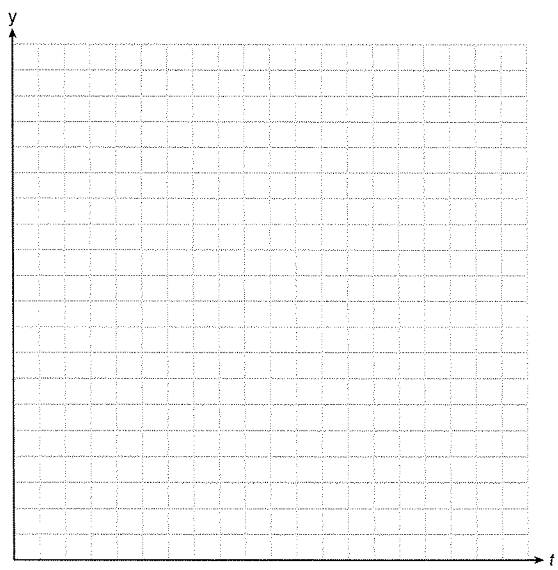
6. Solve for x: $\frac{1}{x}-\frac{1}{3}=-\frac{1}{3x}$

7. A house purchased 5 years ago for \$100,000 was just sold for \$135,000. Assuming exponential growth, approximate the annual growth rate, to the *nearest percent*.

8. Drugs break down in the human body at different rates and therefore must be prescribed by doctors carefully to prevent complications, such as overdosing. The breakdown of a drug is represented by the function $N(t) = N_0(e)^{-rt}$, where $N(t)$ is the amount left in the body, N_0 is the initial dosage, r is the decay rate, and t is time in hours. Patient A, $A(t)$, is given 800 milligrams of a drug with a decay rate of 0.347. Patient B, $B(t)$, is given 400 milligrams of another drug with a decay rate of 0.231.

Write two functions, $A(t)$ and $B(t)$, to represent the breakdown of the respective drug given to each patient.

Graph each function on the set of axes below.



To the nearest hour, t, when does the amount of the given drug remaining in patient B begin to exceed the amount of the given drug remaining in patient A?

The doctor will allow patient A to take another 800 milligram dose of the drug once only 15% of the original dose is left in the body. Determine, to the *nearest tenth of an hour*, how long patient A will have to wait to take another 800 milligram dose of the drug.

H. Regression and Use of the Graphing Calculator

Note: For guidance in using your calculator to graph a scatterplot and finding the equation of the linear regression (line of best fit), please see the calculator direction sheet included in the back of the review packet.

PRACTICE SET 11

1. The following table shows the math and science test scores for a group of ninth graders.

Math Test Scores	60	40	80	40	65	55	100	90	85
Science Test Scores	70	35	90	50	65	40	95	85	90

Let's find out if there is a relationship between a student's math test score and his or her science test score.

a. Fill in the table below. Remember, the variable quantities are the two variables you are comparing, the lower bound is the minimum, the upper bound is the maximum, and the interval is the scale for each axis.

Variable Quantity	Lower Bound	Upper Bound	Interval

b. Create the scatter plot of the data on your calculator.

c. Write the equation of the line of best fit.

d. Based on the line of best fit, if a student scored an 82 on his math test, what would you expect his science test score to be? Explain how you determined your answer. Use words, symbols, or both.

e. Based on the line of best fit, if a student scored a 53 on his science test, what would you expect his math test score to be? Explain how you determined your answer. Use words, symbols, or both.

2. Use the chart below of winning times for the women's 200-meter run in the Olympics below to answer the following questions.

Year	Time (Seconds)
1964	23.00
1968	22.50
1972	22.40
1976	22.37
1980	22.03
1984	21.81
1988	21.34
1992	21.81

a. Fill in the table below. Remember, the variable quantities are the two variables you are comparing, the lower bound is the minimum, the upper bound is the maximum, and the interval is the scale for each axis.

Variable Quantity	Lower Bound	Upper Bound	Interval

b. Create a scatter plot of the data on your calculator.

c. Write the equation of the regression line (line of best fit) below. Explain how you determined your equation.

d. The Summer Olympics will be held in London, England, in 2012. According to the line of best fit equation, what would be the winning time for the women's 200-meter run during the 2012 Olympics? Does this answer make sense? Why or why not?

FACTORING

1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________
8. ____________
9. ____________
10. ____________

RADICALS

1. ________
2. ________
3. ________
4. ________
5. ________
6. ________
7. ________
8. ________
9. ________
10. ________

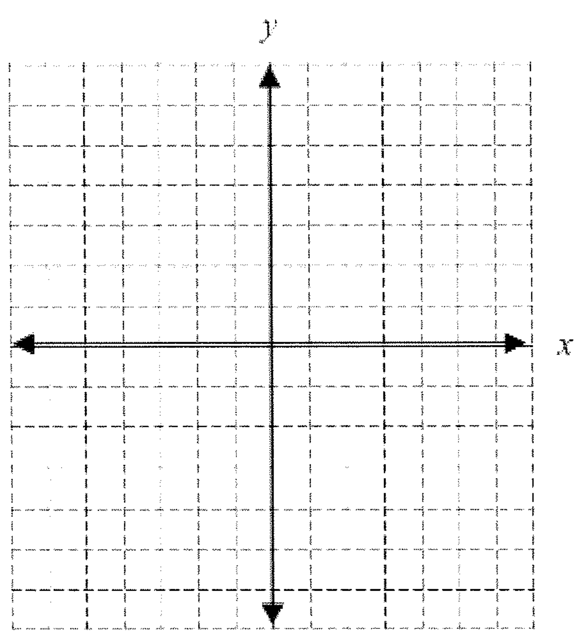
GRAPHING LINES

Finding Slope

1. ________
2. ________
3. ________
4. ________
5. ________
6. ________

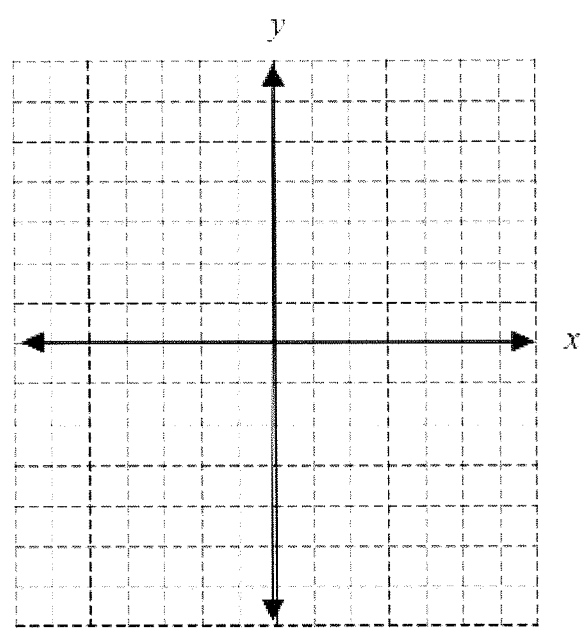
1. $y = 2x + 5$

Slope: _____ y-intercept: _____

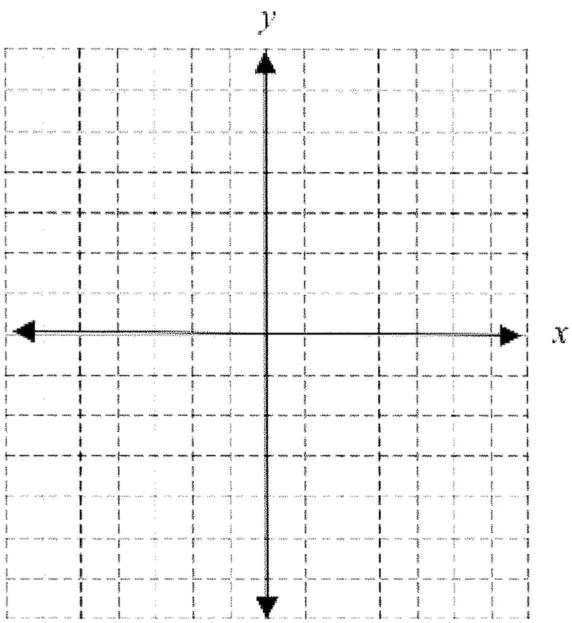


2. $y = \frac{1}{2}x - 3$

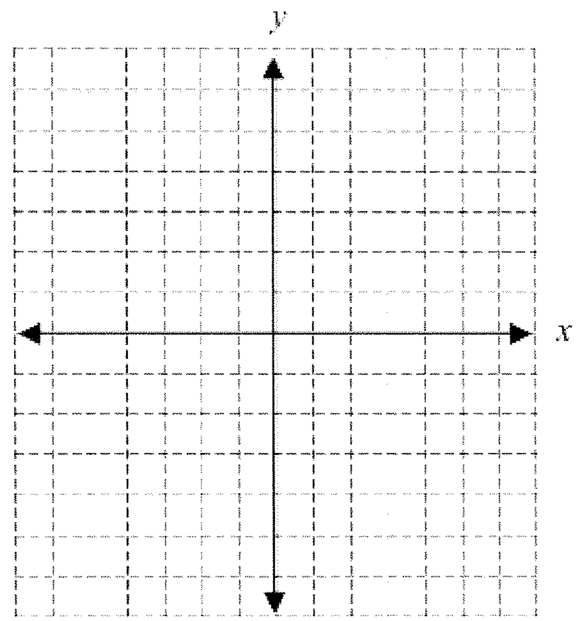
Slope: _____ y-intercept: _____



1. $3x + y = 3$



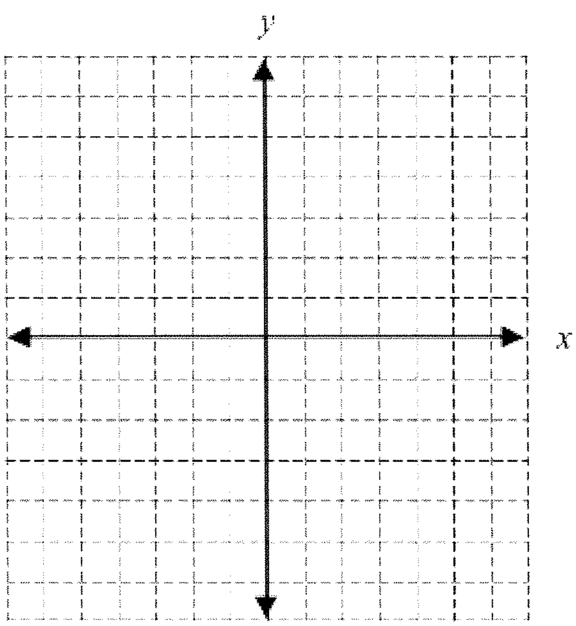
2. $5x + 2y = 10$



5. $y = -x + 2$

Slope: ______________

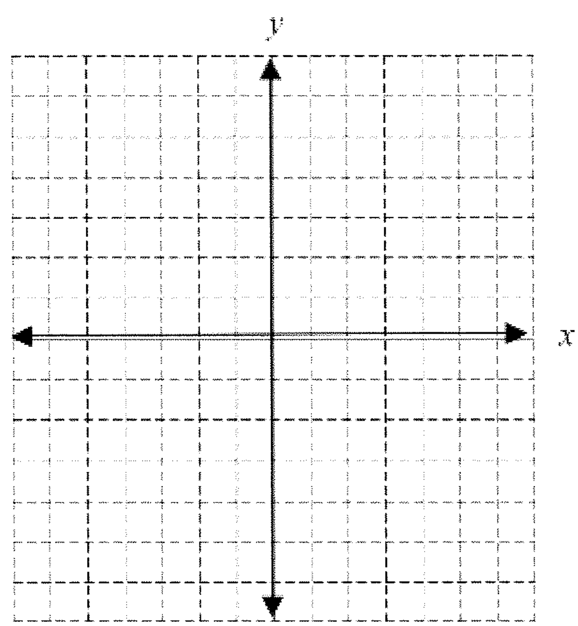
y-intercept: ______________



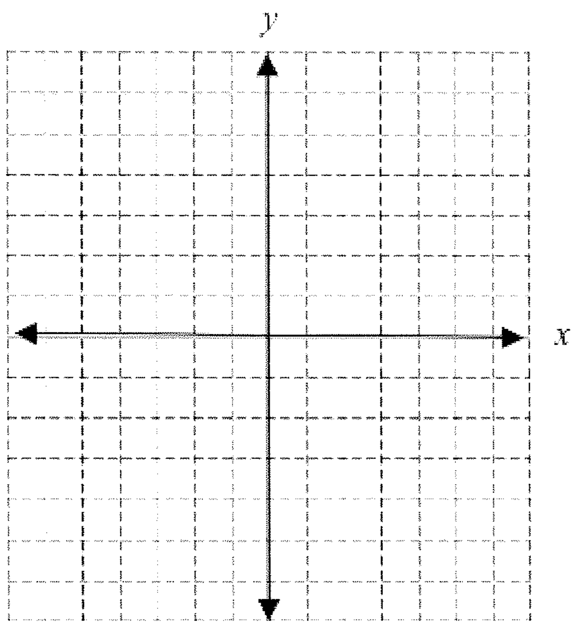
6. $y = x$

Slope: ______________

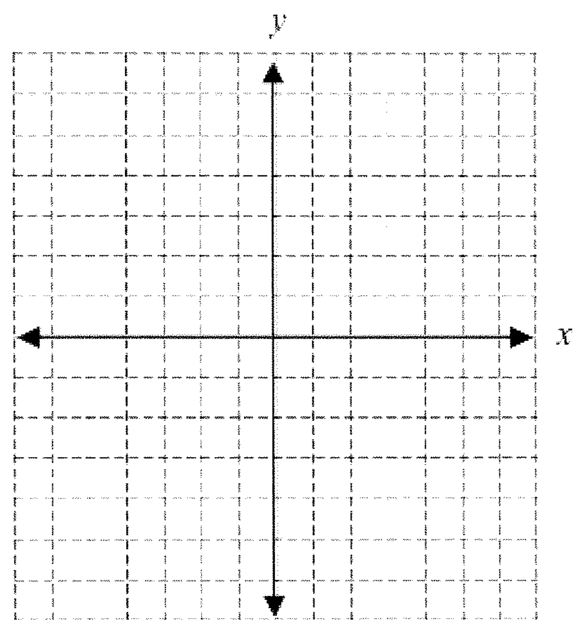
y-intercept ______________



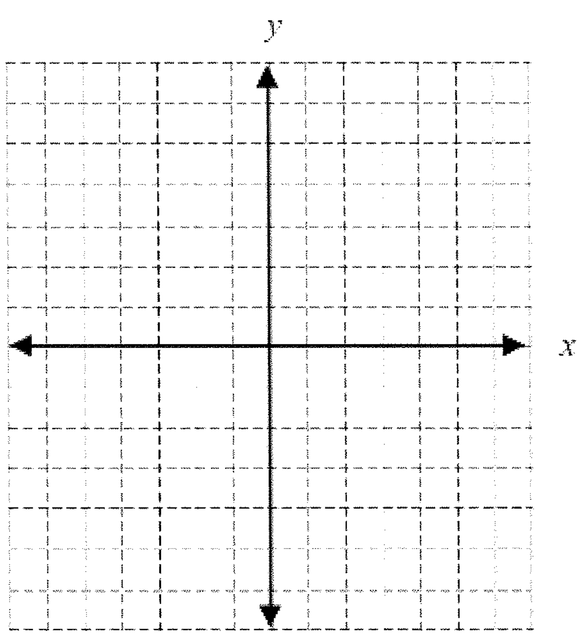
1. $3x + y = 3$



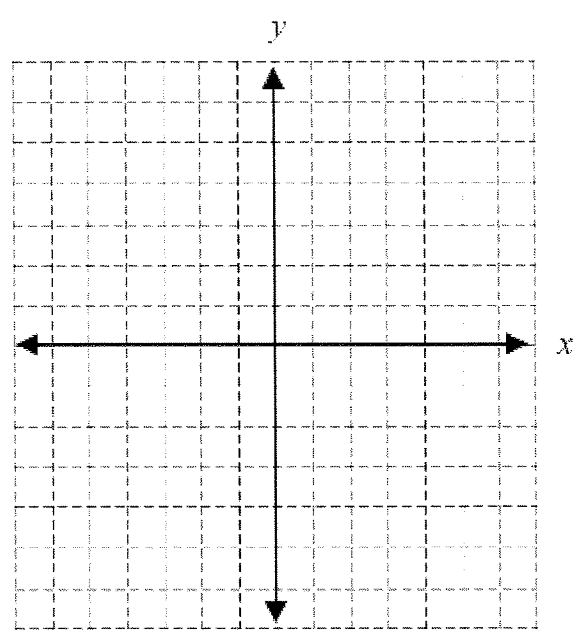
2. $5x + 2y = 10$



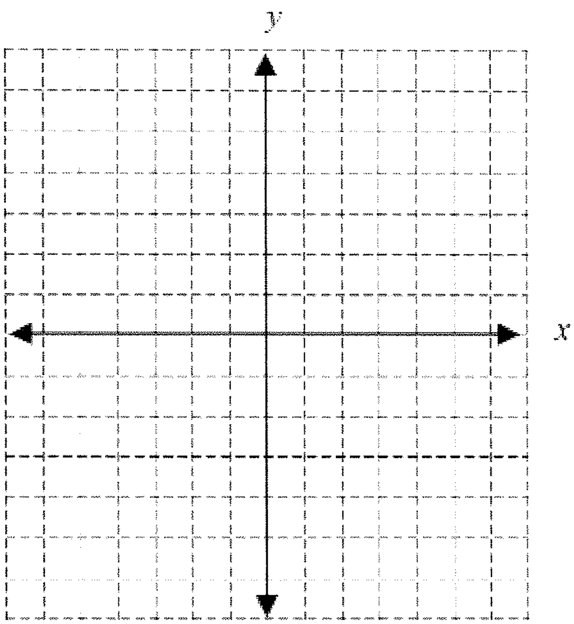
3. $y = 4$



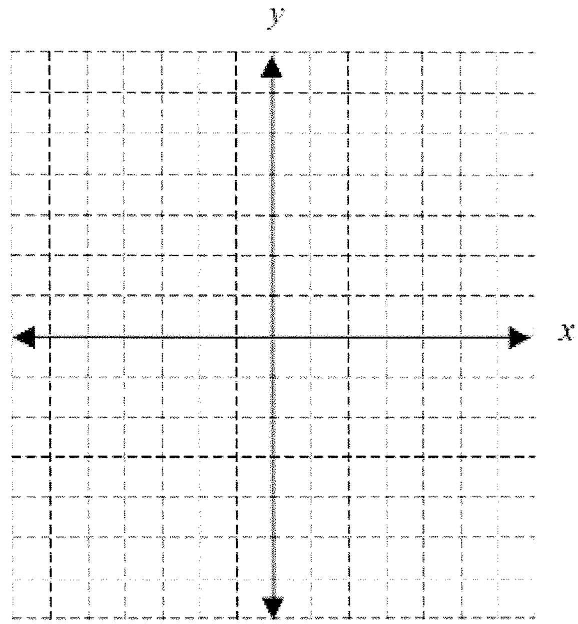
4. $4x - 3y = 9$



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



6. $x=-3$



MIXED REVIEW

1. ___________
2. ___________
3. ___________
4. ___________
5. ___________
6. ___________
7. ___________

SIMPLIFYING POLYNOMIAL EXPRESSIONS

1. ____________ 6. ____________
2. ____________ 7. ____________
3. ____________ 8. ____________
4. ____________ 9. ____________
5. ____________ 10. ____________

RULES OF EXPONENTS

1. ________
2. ________
3. ________
4. ________
5. ________
6. ________
7. ________
8. ________
9. ________
10. ________
11. ________
12. ________
13. ________
14. ________
15. ________

SOLVING EQUATIONS

1. ________ 6. ________
2. ________ 7. ________
3. ________ 8. ________
4. ________ 9. ________
5. ________ 10. ________

LITERAL EQUATIONS

1. ____________ 4. ____________
2. ____________ 5. ____________
3. ____________ 6. ____________

BINOMIAL MULTIPLICATION

1. ________ 6. ________
2. ________ 7. ________
3. ________ 8. ________
4. ________ 9. ________
5. ________ 10. ________