Summer Work Packet for MPH Math Classes

Students going into Pre-calculus AC Sept. 2020

Name: ______________________________

This packet is designed to help students stay current with their math skills. Each math course expects a certain level of number sense, algebra sense, and graph sense in order to be successful in the course.

Complete these problems in the space provided by Friday, September 11th. Be sure to show all work. We will check this assignment in class. We will have quizzes on these topics in the following weeks.

Please email me at dmeehan@mphschool.org with any questions.

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**** You will need a TI-84+ calculator for this class.****

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Linear Functions & Inequalities Name ______________________

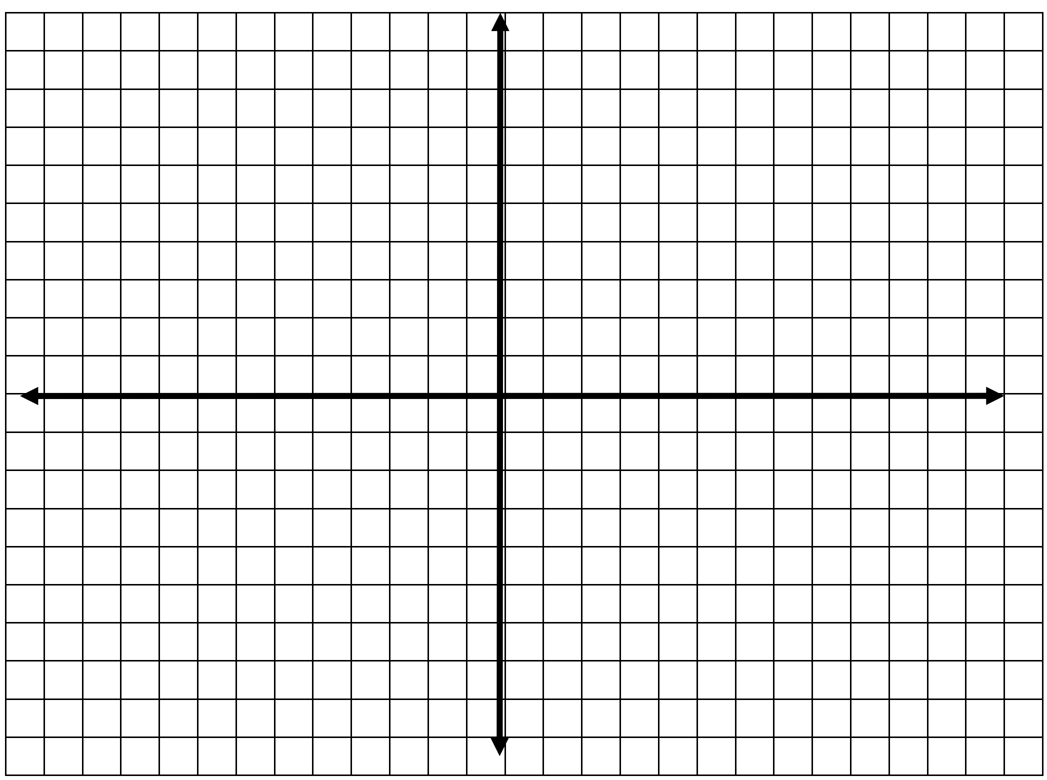
1. Given: 3x – 4y = 12.

A. Find the coordinates of the x-intercept: _________ and y-intercept: _________ .

B. Use these to calculate the slope. m = ______

C. Write the equation of a line parallel to the given line and going through the point (0, 2).

D. Graph both lines below.



2. Given: m = – ½ and A (–4, 3) **Name ____________________**

A. Write the equation of the line in point-slope form: _________________________

B. Write the equation of the line perpendicular to the given line going through the point (2, 1) in point-slope form. ____________________________

3. Given: (y – 2) = ¾(x + 4)

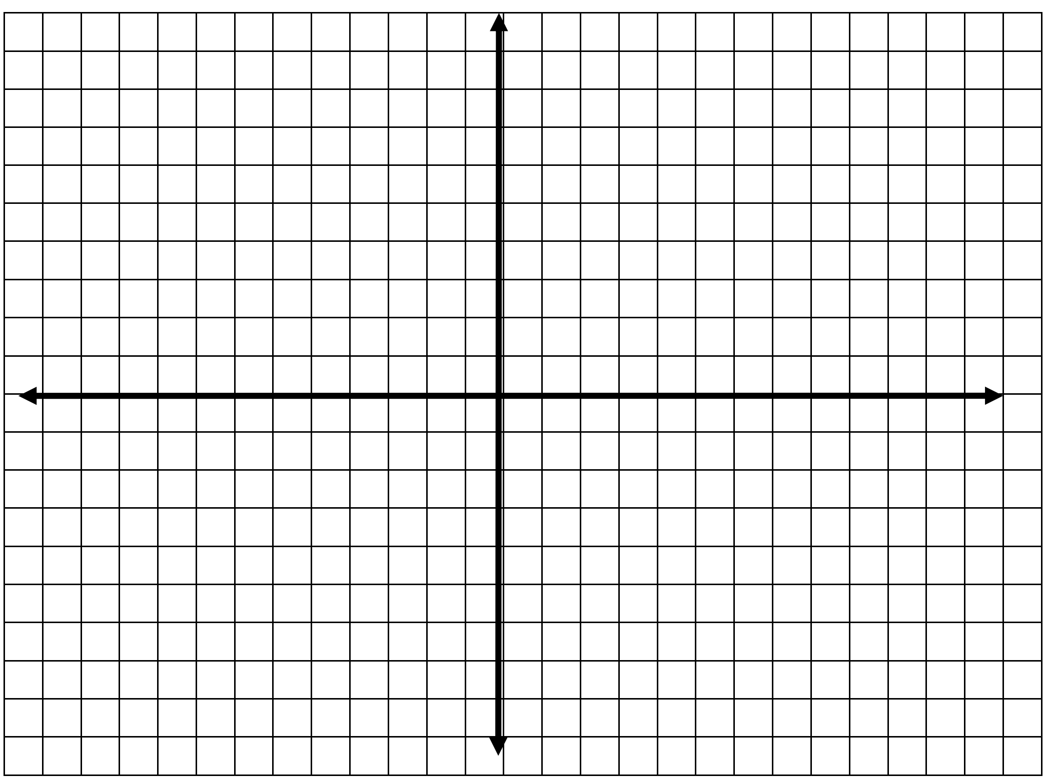
A. Name a point on the line. P (___, ___)

B. Find the slope. m = __________

C. Find f(–8). f(–9) = ________

4. **Graph** the inequalities. Name the **points of intersection**. **Label** the solution area. **Show your check** to verify the shaded area is correct.

$y > \frac{2}{3}x - 1$ and $y \le -x - 2$ and $x > -3$



System of Equations **Name ____________________**

Solve for the variables using the <u>elimination</u> method. <u>Check</u>.

1. $5k + 9h = 13$
   $6k + 3h = 13$

2. $a + b + c = 6$
   $2a + b - 2c = -10$
   $a + 4b + c = 2$

Solve for the variables using the <u>substitution</u> method. <u>Check</u>.

3. $y = 3x - 12$
   $3x - 2y = 125$

Algebra Review: Simplify completely. **Name ____________________**

1. $$\frac{3/2 + 5/x}{1 + 3/4x}$$

2. $$\frac{a^{-1} + b^{-1}}{a - b}$$

3. $$\frac{28x^4y^5 - 16x^4y^3 + 4x^8y}{4x^4y}$$

Name ______________________

4. $\dfrac{(3y^2-108)(y^3+2y^2-24y)}{y(y^2+12y+36)(3y^2-30y+72)}$ (Leave your answer in factored form.)

5. $\dfrac{m^4-1}{m^3-m^2+m-1}$ (Leave your answer in factored form.)

6. $\dfrac{ab^2c}{15} \div \dfrac{abc^3}{12} \cdot \dfrac{18bc}{2}$

Name ____________________

7. $\dfrac{6m-18n}{9m+9n}\cdot\dfrac{4m-4n}{24n-8m}$ (Leave your answer in factored form.)

8. $\dfrac{6a^2-11a+3}{8a^2-10a-3}\div\dfrac{6a^2+7a-3}{8a^2+14a+3}$ (Leave your answer in factored form.)

9. $\dfrac{a^2b-2ab^2}{a^2+2ab-3b^2}\div\dfrac{a^2+6ab}{a^2+11ab-12b^2}\div\dfrac{ab-2b^2}{a^2+9ab+18b^2}$ (Leave your answer in factored form.)

10. $\frac{5}{6x}+\frac{3}{4y}$

Name ______________________

11. $\frac{x}{x+2}-\frac{1}{x^{2}-4}$

12. $\frac{7}{d^{2}-100}+\frac{4}{d^{2}+11d+10}$

13. $\frac{7}{4x^{2}-1}-\frac{2}{1-2x}-\frac{3}{2x-1}$

Algebra Review: Solve and check. **Name ______________________**

14. $w^2 + 8w + 7 = 0$

15. $3b^3 + 13b = 7b^2$

16. $2p^3 + p^2 - 8p - 4 = 0$

17. $\frac{5}{h} + \frac{1}{2} = -2$

18. $\frac{3}{c}-\frac{2}{c-1}=\frac{1}{c^2-c}$

19. $\frac{5}{2c+6}-\frac{1-2c}{4c}=2$

20. $\frac{a}{a-3}+\frac{a^2}{a^2-7a+12}=\frac{2a+1}{a-4}$

Functions **Name ___________________________**

Fill in the blanks with a rule to represent 2 different situations. Write one that represent a function and one that does not. Explain why each is or is not a function.

Ex. 1: The number of loads of laundry I do is a function of the number of people at home during the week. FUNCTION

Ex. 2: The age of each person in the class is dependent on the numbers 15, 16 and 17. (NOT a FUNCTION-More than one person could be each age.)

1. ________________________________ is ____

Function? Yes or No? Why?

2. ________________________________ is ____

Function? Yes or No? Why?

Odd and Even Functions **Name** ____________________

Prove **algebraically** that the function is odd, even or neither. Choosing a numerical value for x does **NOT** prove odd/even. It must be shown true for ALL values of x. Follow the example. Show your work.

Definition: f(x) is **odd,** if f (–x) = –f (x). f(x) is **even,** if f (–x) = f (x).

Otherwise, the function is **neither** odd nor even.

Example: $f(x) = 4x^3 - 5x$

Find f(–x): $f(-x) = 4(-x)^3 - 5(-x) = -4x^3 + 5x$. Thus, $f(-x) \neq f(x)$.

Find –f(x): $-f(x) = -(4x^3 - 5x) = -4x^3 + 5x$. Thus, $-f(x) = f(-x)$ and the function is ODD.

1. $f(x) = -3x + 1$

4. $f(x) = 3x^2 + 1/x^2$

2. $f(x) = (x - 5)^2$

5. $f(x) = 1/4x$

3. $f(x) = x^2 + 4$

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

<u>Quadratic Inequalities and Sign Patterning</u> **Name ____________________**

Use the number lines to indicate the sign of each factor. From this, determine the intervals of x values which make the inequality true.

EXAMPLE 1: $4x^3 \geq 4x^2 + 24x$

$4x^3 - 4x^2 - 24x \geq 0$
$4x\,(x^2 - x - 6\,) \geq 0$
$4x\,(x - 3)(x + 2) \geq 0$

EXAMPLE 2: $\dfrac{4x(x-3)}{(x+2)} < 0$

Use the same number lines because multiplication and division with negative numbers have the same rules.

factor value: negative negative **0** positive positive **<u>factor</u>**
x values: **-2** **0** **3** 4x

negative negative negative **0** positive (x – 3)
-2 **0** **3**

negative **0** positive positive positive (x + 2)
-2 **0** **3**

expression: negative *0 positive **0** negative **0** positive x(x – 3)(x + 2)
-2 **0** **3**

Therefore, the solution set for Example 1 is {x| –2 ≤ x ≤ 0 or x ≥ 3}.

Therefore, the solution set for Example 2 is {x| x < –2 or 0 < x < 3}. (Example 2 is undefined at x = –2.*)

1. **Compare the expression to 0.**
2. **Factor.**
3. **Determine when each factor is 0, positive, and negative, and record on a number line.**
4. **Multiply/divided the groups to determine the sign of the final expression.**

Name ______________________

Find the solution set using the sign patterning method. Graph the solution on a number line.

1. $w^2 - 7w < 0$

4. $(2 - p)(4 - p)(7 - p) > 0$

2. $30 + c - c^2 \leq 0$

5. $\frac{k}{6-k} < 0$

3. $18x^3 \leq 2x$

6. $\frac{g^2 + 3g - 28}{g - 2} < 0$

Logarithms-Solve & check. Show work. **Name ____________________**

1. $\log_4(x+1)=3$

2. $\log_3(x^2)=5$

3. $\log_5(x+2)=\log_5(4x-6)$

4. $\log_5(x^2-4)=\log_5(3x)$

5. $\log(x+1)+\log(x-2)=1$

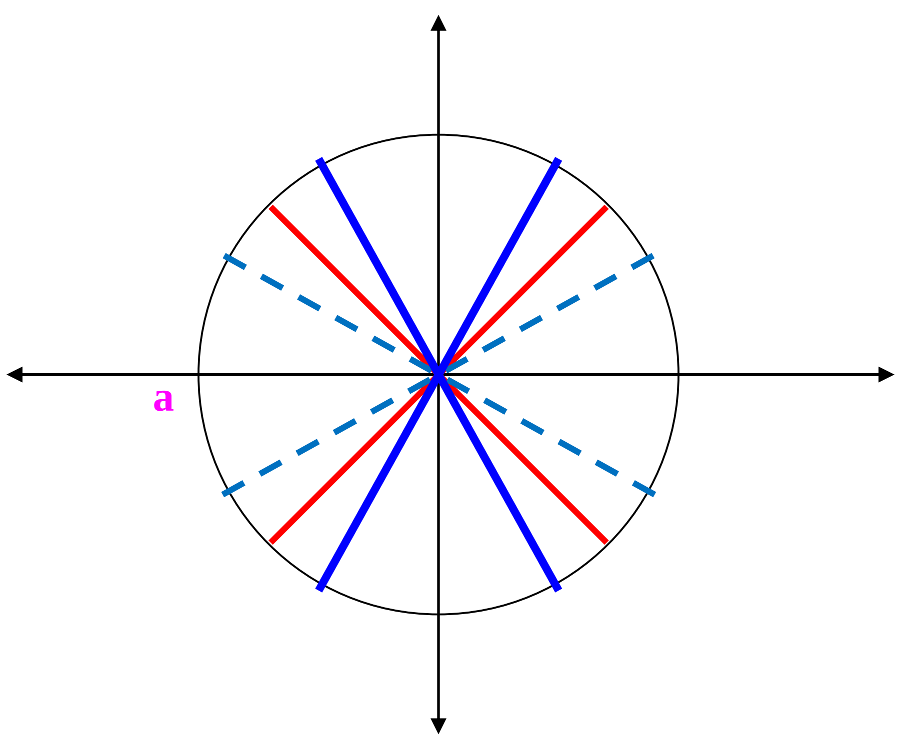
To help you learn about the UNIT CIRCLE and the trigonometry functions, you can explore the following websites (and many others that you can google). When you understand degrees, radians, positive/negative angles, the 6 functions and their relationship to a right triangle, then you should do the problems on the next page. Everything relates to the 45°-45°-90° and 30°-60°-90° right triangles and the relationship of their sides that you learned about in geometry.

TRIGONOMETRY
Amazing Unit circle
http://mathmistakes.info/facts/TrigFacts/learn/uc/uc.html
More Unit Circle
http://www.mathsisfun.com/geometry/unit-circle.html
Unit circle GAME
http://www.mathwarehouse.com/unit-circle/unit-circle-game.php
Colorful picture of entire unit circle
http://www.analyzemath.com/unitcircle/special_angles.html
Another full unit circle
http://en.wikipedia.org/wiki/Image:Unit_circle_angles.svg
Degrees to Radians Practice
https://www.khanacademy.org/math/trigonometry/unit-circle-trig-func/radians_tutorial/e/degrees_to_radians
Interactive Radian and Degree Practice with UNIT CIRLE http://goo.gl/epSfWQ
More practice Degrees to Radians (multiple choice)
http://www.ixl.com/math/algebra-2/convert-between-radians-and-degrees
Video Tutorial with Right Triangle Applications
http://www.youtube.com/watch?v=2gqRR1w71CE
LINKS FOR GRAPHING TRIG FUNCTIONS:
Graphing sine and cosine applets https://www.geogebra.org/m/znb4GNk7
Desmos Unwrapping Unit Circle https://www.desmos.com/calculator/cpb0oammx7
Unwrapping the Unit Circle http://www.analyzemath.com/unitcircle/unit_circle_applet.html

Reference Angles & Trig Functions **Name** ____________________

1) Using the **unit circle**, give the <u>exact value</u> of each trigonometric expression. Pay attention to the sign of the answer (no calculator).
2) On the unit circle mark the letter of each problem in the correct angle position. Letter **a** is done for you.

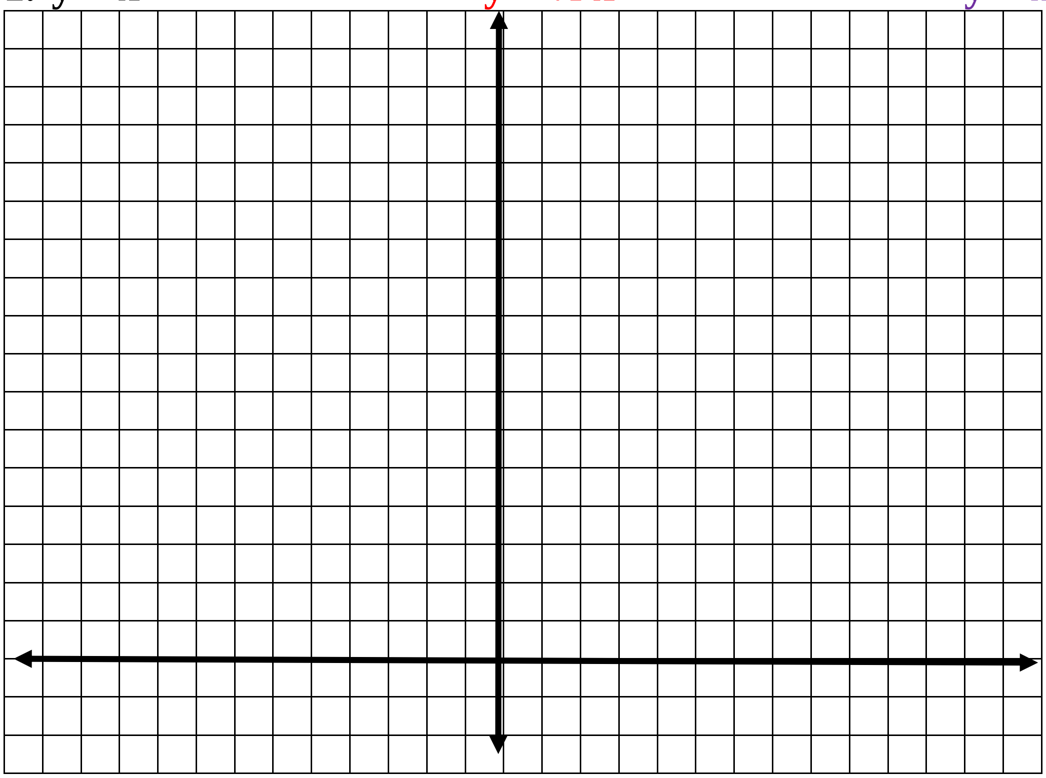
a) sin(π)	__**0**__	i) tan(–19π/4)	______
b) cos(5π/4)	______	j) sec(14π)	______
c) tan(11π/6)	______	k) csc(13π/4)	______
d) cot(22π/3)	______	l) cot(19π/3)	______
e) sec(13π/2)	______	m) tan(–17π)	______
f) csc(–28π)	______	n) sin(47π/3)	______
g) sin(41π/6)	______	o) cos(–17π/6)	______
h) cos(–7π/3)	______	p) sin(–29π/4)	______



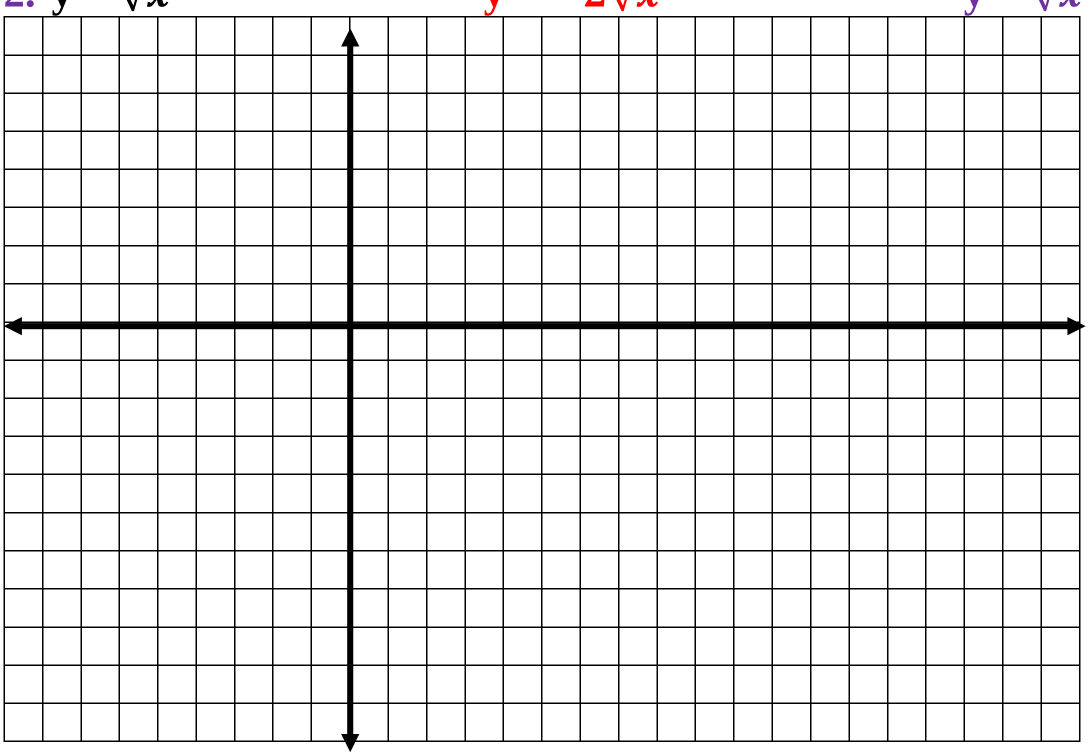
Graphing Functions **Name ____________________**

Graph the following functions on the graph below. Be sure to label your axes and identify the scale on each axis. Do all 3 in each question on the same set of axes.

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

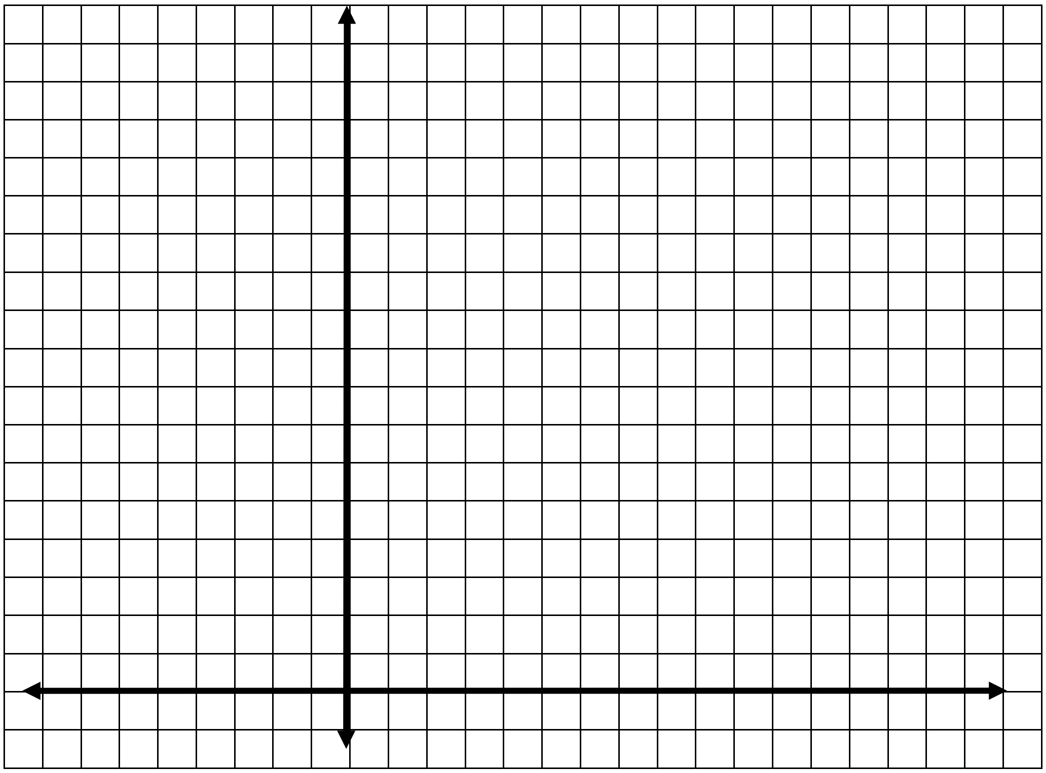


2. $y = \sqrt{x}$ $y = -2\sqrt{x}$ $y = \sqrt{x} - 3$

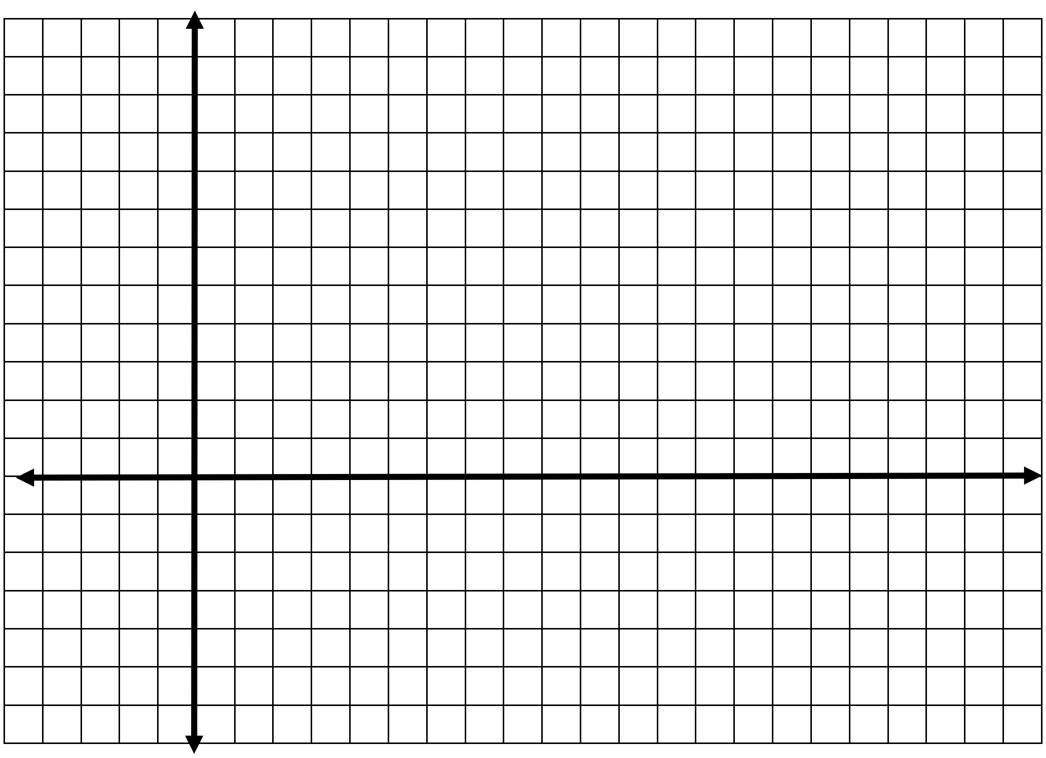


Name ________________

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



4. $y = \log_3(x)$ $y = \log_3(x) + 2$ $y = \log_3(x - 2)$



Name ____________________

5. y = sin(x) **y = cos(x)**

Graph from –2π to 2π. Use 6 BLOCKS = π on the x-axis and 2 BLOCKS = 1 on the y-axis. (If you use your calculator, be sure to put it in radian mode and use ZOOM TRIG for the window.)