Summer Work Packet for MPH Math Classes

Students going into Pre-calculus AC Sept. 2018

Name: ______________________________

This packet is designed to help students stay current with their math skills.

Each math class expects a certain level of number sense, algebra sense and graph sense in order to be successful in the course.

These problems need to be completed in the space provided and handed in for a grade by September 7th. Be sure to show all work.

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 ______________________

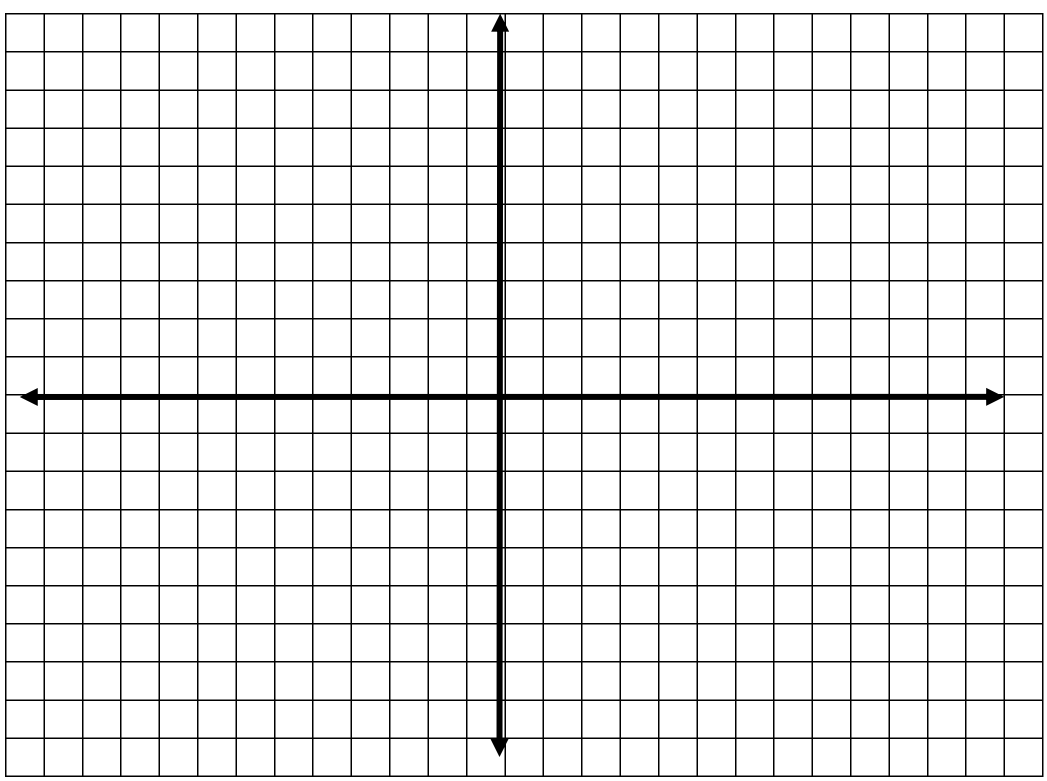
1. Given: $6x - 4y = 12$.

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, –3).

D. Graph both lines below.



2. Given: $m = -\frac{1}{2}$ and A $(-2, 5)$ **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 (4, 5) in point-slope form. ___________________________

3. Given: $(y - 3) = \frac{3}{4}(x + 5)$

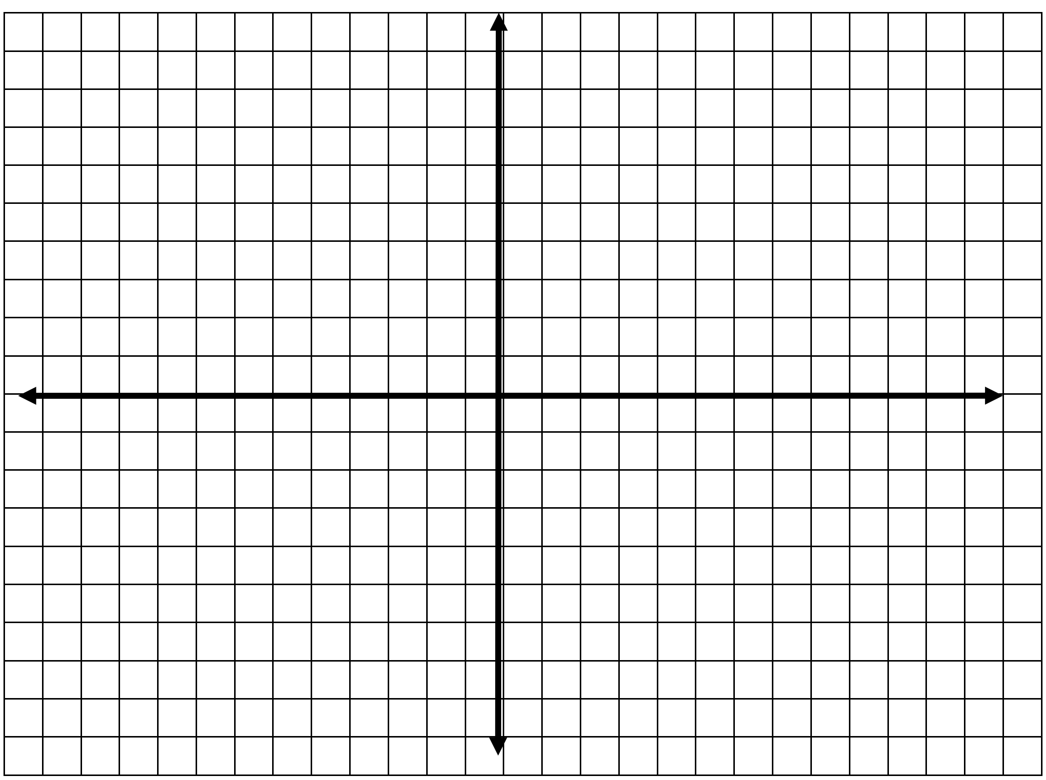
A. Name a point on the line. P (___, ___)

B. Find the slope. $m =$ __________

C. Find f(–9). $f(-9) =$ ________

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

$y > \frac{2}{3}x - 2$ and $y \leq -x - 3$ and $x < 3$



System of Equations **Name ____________________**

Solve for the variables using the elimination method. Check.

1. $$\begin{aligned} 5k + 9h &= 13 \\ 6k + 4h &= 2 \end{aligned}$$

2. $$\begin{aligned} a + b + c &= 6 \\ 2a + b - 2c &= -10 \\ a + 4b + c &= 2 \end{aligned}$$

Solve for the variables using the substitution method. Check.

3. $$\begin{aligned} y &= 5x - 12 \\ 5x - 2y &= 124 \end{aligned}$$

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

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

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

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

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 3 different situations. Write two that represent a function and one that do not. Explain why each is or is not a function.

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

Ex. 2: <u>The fraction of the pool that is filled with water</u> is a function of <u>the amount of time the hose has been filling it.</u>

Ex. 3: <u>The age of each person in the class</u> is dependent on <u>the numbers 15, 16 and 17</u>. (More than one person could be each age, or someone could be a different age.)

1. _________________________________ is ____

Function? Yes or No? Why?

2. _________________________________is ____

Function? Yes or No? Why?

3. _________________________________ 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.

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. $f(x) = 6x$

4. $f(x) = \frac{1}{4x}$

2. $f(x) = x^2 - 4$

5. $f(x) = 3x^2 + \frac{1}{x^2}$

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

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

Quadratic Inequalities and Sign Patterning 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: $\frac{x(x-3)}{(x+2)} < 0$

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

factor value: negative	negative	**0**	positive	positive			**factor** 4x
x values:	-2		0		3		
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.*)

Name ______________________

Find the solution set using the <u>sign patterning</u> method. Graph the solution on a number line.

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

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

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

6. $\frac{3}{5+x} < 0$

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

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

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

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

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

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

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

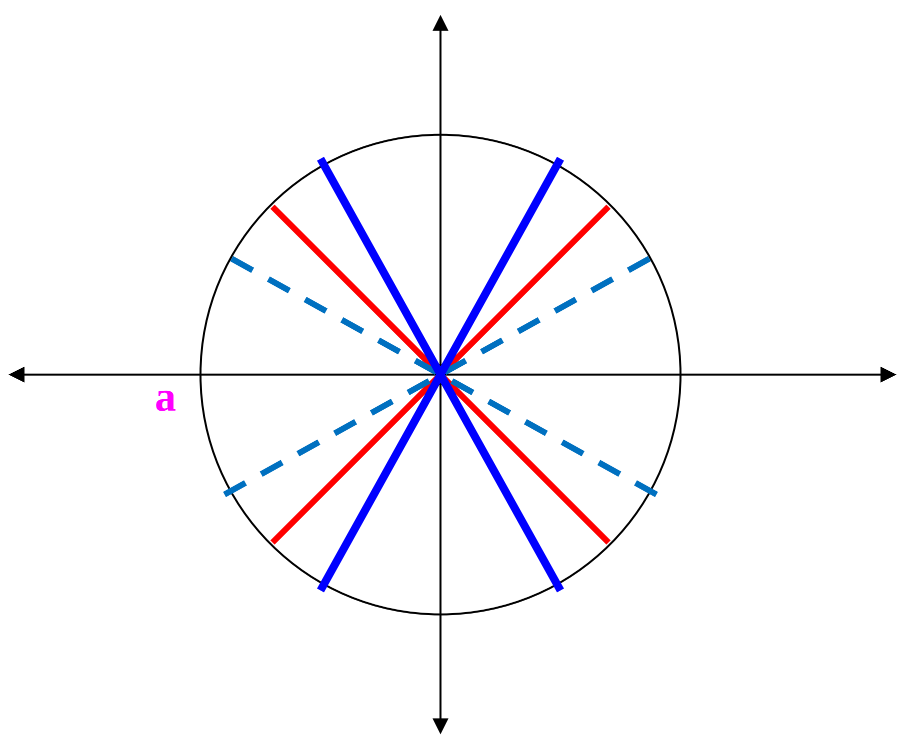
4. $\log_5(x^2-4)=\log_5(3x)$

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

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.

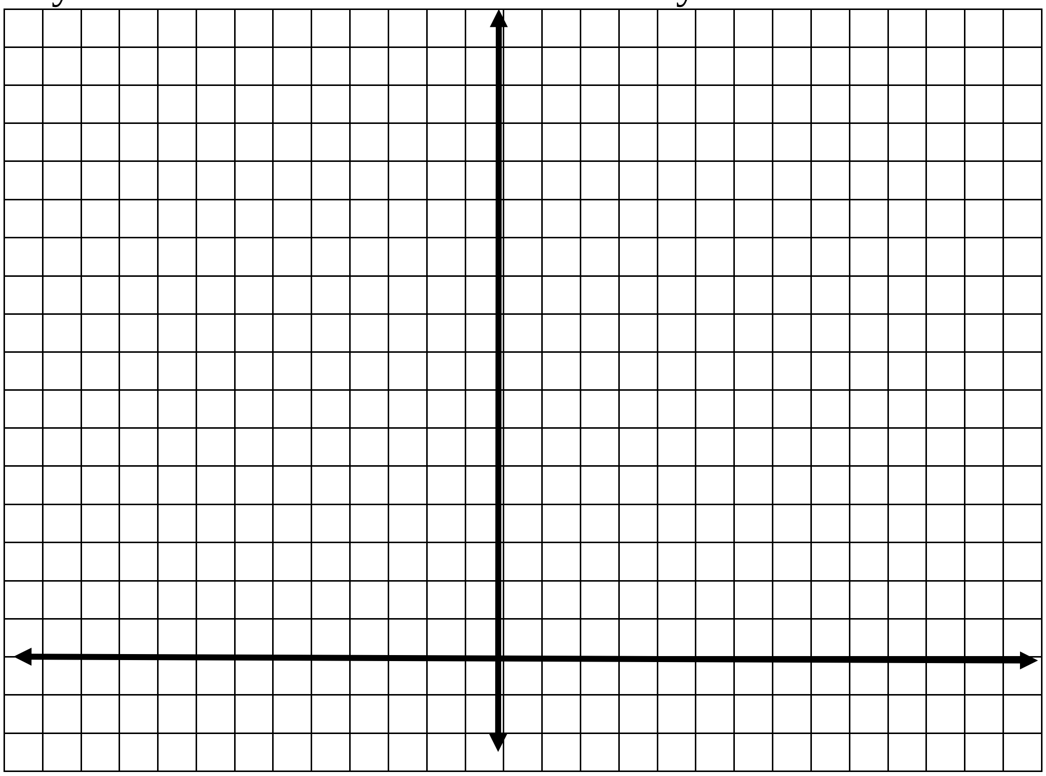
a) $\sin(\pi)$	__**0**__	i) $\csc(-19\pi/4)$	_____
b) $\cos(5\pi/4)$	_____	j) $\cos(14\pi)$	_____
c) $\tan(11\pi/6)$	_____	k) $\sec(13\pi/4)$	_____
d) $\cot(22\pi/3)$	_____	l) $\tan(19\pi/3)$	_____
e) $\sec(13\pi/2)$	_____	m) $\cot(-17\pi)$	_____
f) $\csc(28\pi)$	_____	n) $\sin(47\pi/3)$	_____
g) $\sin(41\pi/6)$	_____	o) $\cos(-11\pi/6)$	_____
h) $\tan(-7\pi/3)$	_____	p) $\sin(-27\pi/4)$	_____



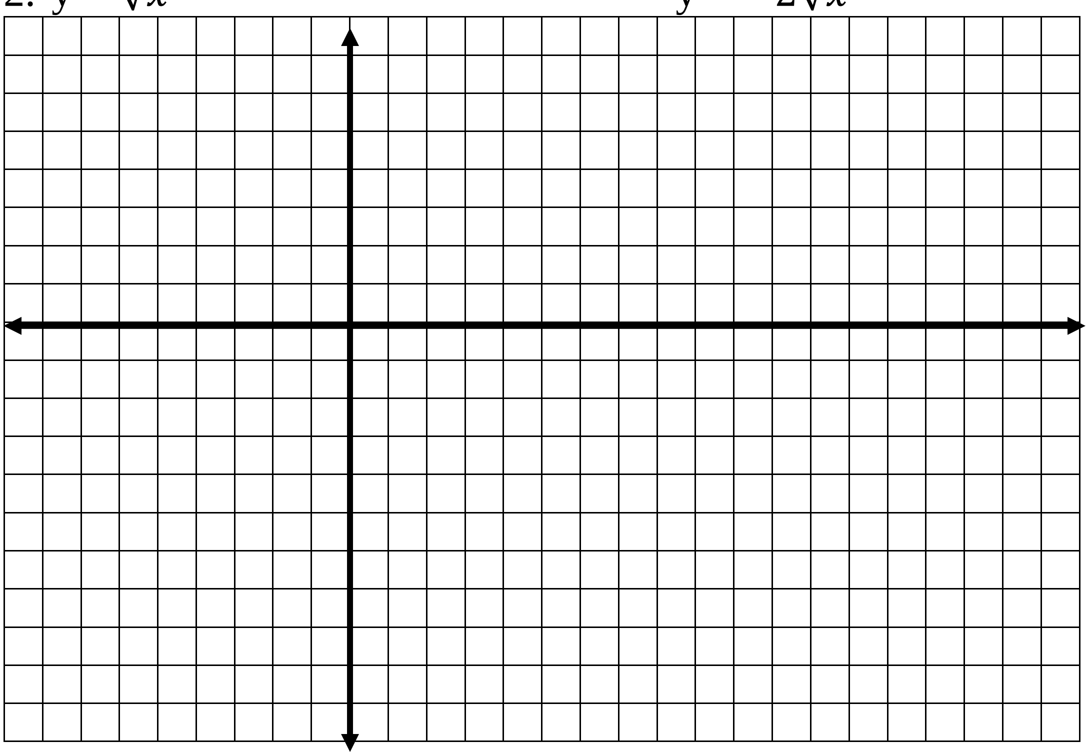
Graphing Functions **Name** ____________________

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

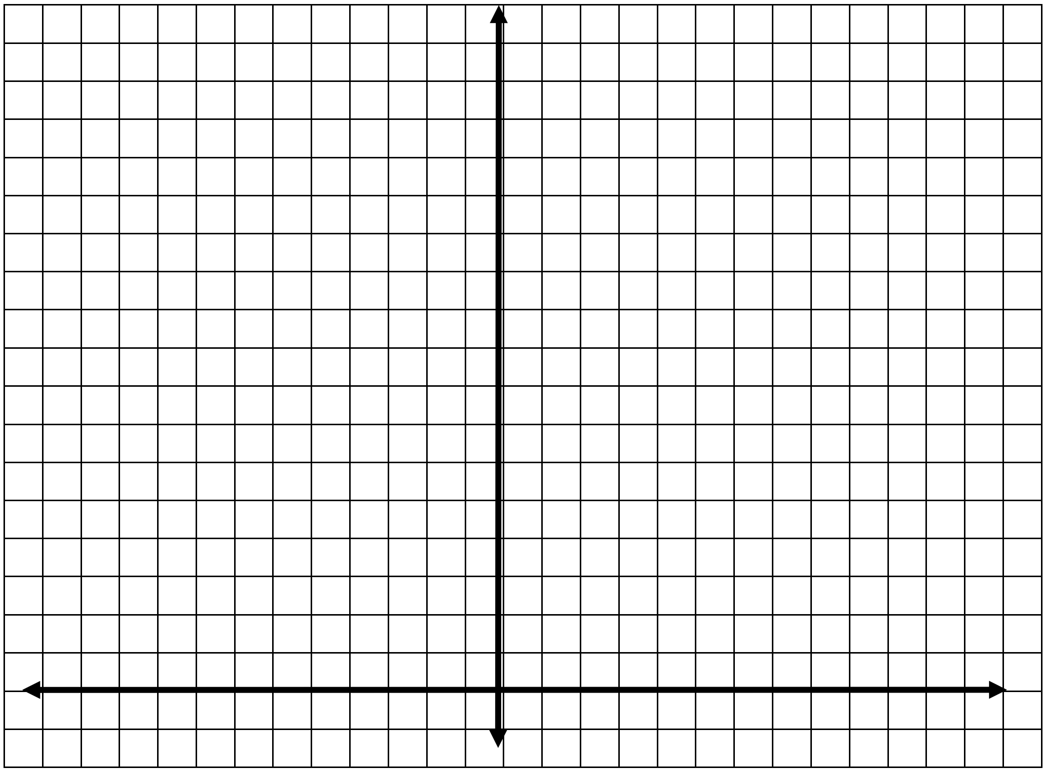
1. $y = x^2$ $y = \frac{1}{2} x^2$



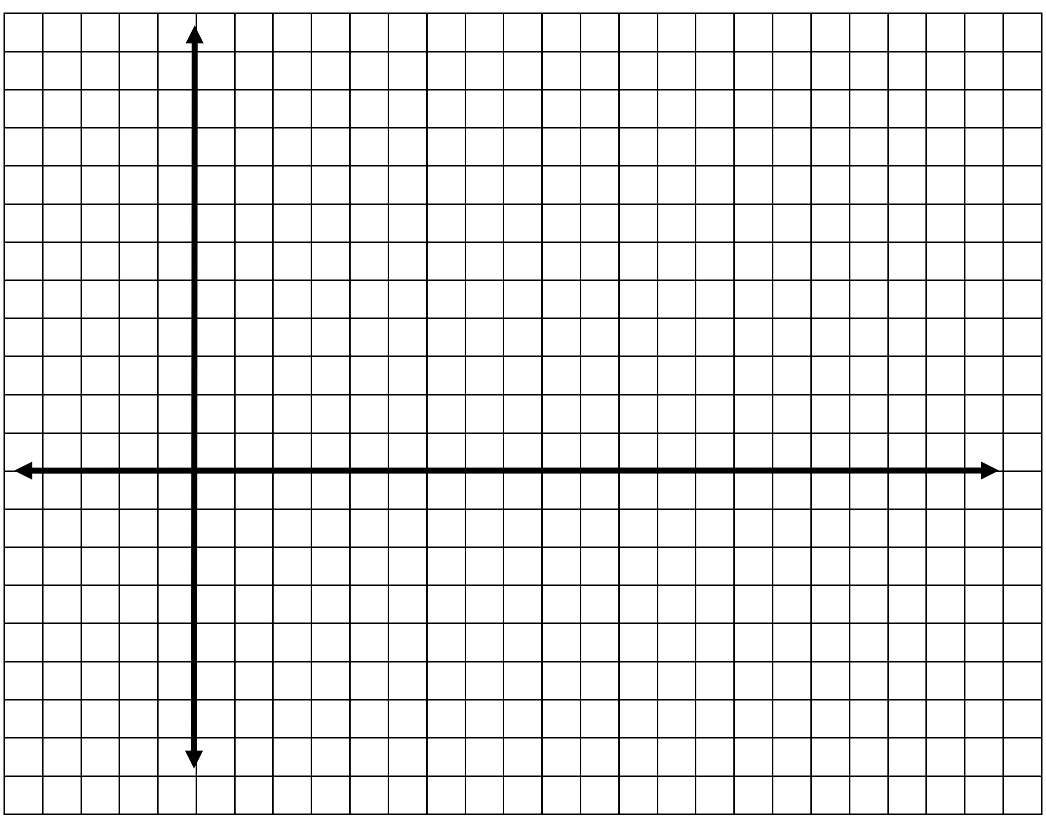
2. $y = \sqrt{x}$ $y = -2\sqrt{x}$



3. $y = 2^{x}$ $y = 2^{x-3}$ **Name** ______________________



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



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.)