Summer Work Packet for MPH Math Classes

Students going into
Pre-calculus
Sept. 2021

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 17th. Be sure to show all work. We will check this assignment in class. Doing 2 pages a week is a nice way to keep a good balance between keeping your math skills strong and enjoying summer fun.

Please email Mrs. Meehan 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 _____

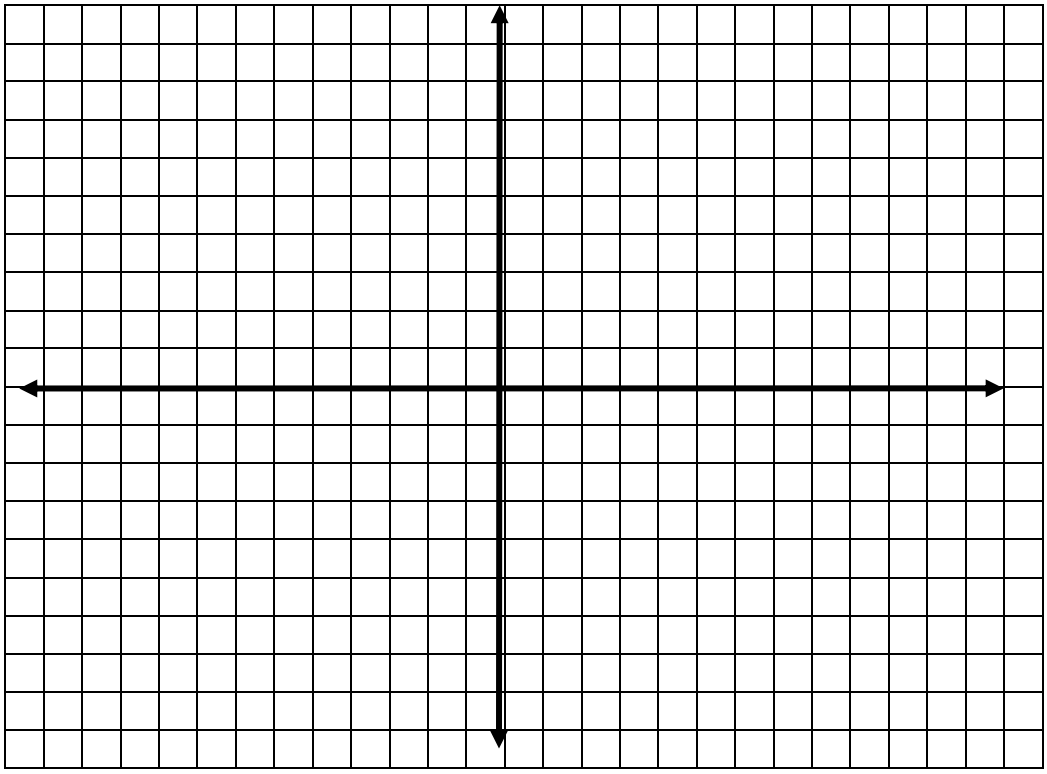
1. Given: $3x - 2y = 6$.

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

B. Use the intercepts 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 = – 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: $(y + 2) = \frac{3}{4}(x - 8)$

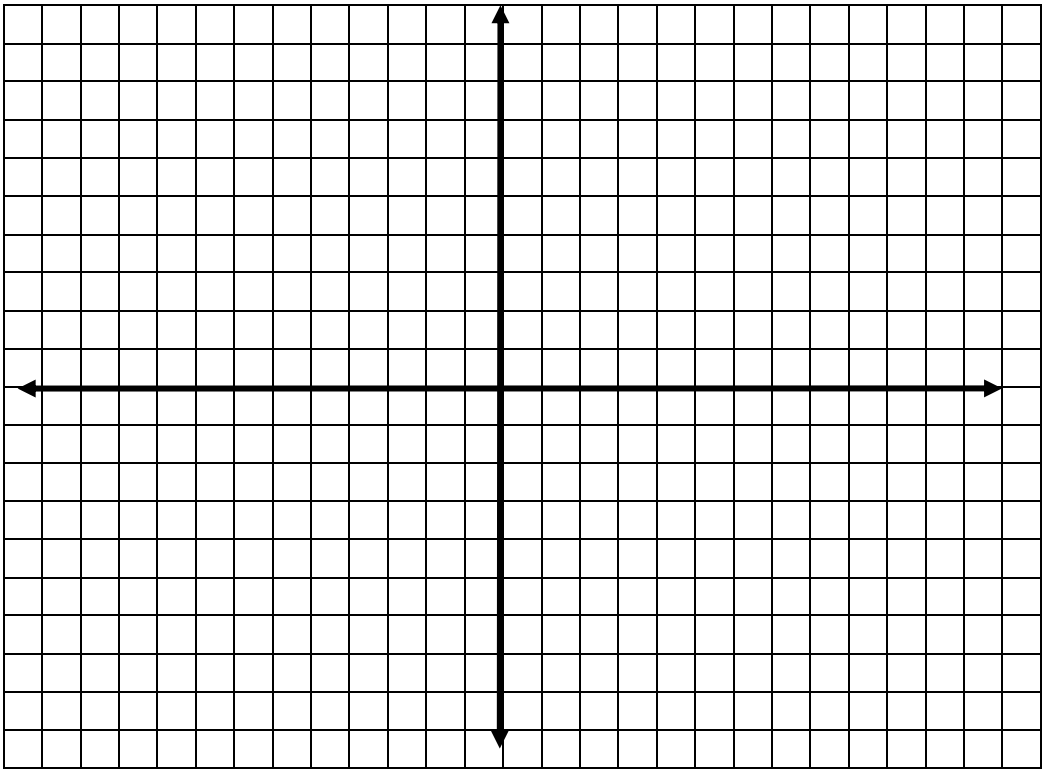
A. Name a point on the line. P (___, ___)

B. State the slope. m = _____

C. Find f(8) = _____ and f(–4) = _____.

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. $5k + 9h = 19$
   $6k + 3h = 15$

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

Solve for the variables using the substitution method. Check.

3. $y = 3x - 20$
   $11x - 2y = 125$

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

1. $\frac{1 + {}^{3}/_{(4x)}}{{}^{3}/_{2} + {}^{5}/_{x}}$

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

3. $\frac{28x^5y^4 - 16x^{10}y^{-3} + 4x^8y}{4x^5y}$

Name _____

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

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

6. $\frac{ab^6c}{12} \div \frac{bc^3}{15} \cdot \frac{18abc}{5}$

Name _____

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

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

9. $\frac{a^2b-2ab^2}{a^2+2ab-3b^2} \div \frac{a^2+6ab}{a^2+11ab-12b^2} \div \frac{ab-2b^2}{a^2+9ab+18b^2}$ (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. $\frac{a}{a-3}+\frac{a^2}{a^2-7a+12}=\frac{2a+1}{a-4}$

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

2. $f(x) = (x – 5)^2$

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

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

Quadratic Inequalities and Sign Patterning **Name** _____

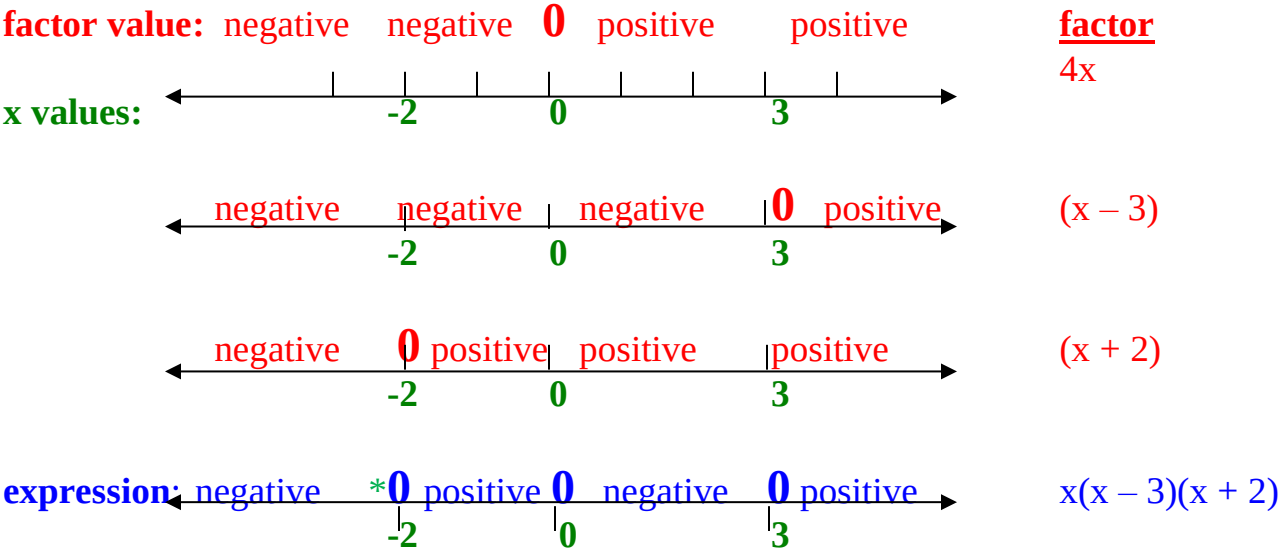
Use the number lines to indicate the sign of each factor. From this, determine the intervals of x values which make the inequality true.

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

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



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 the results on a number line.**
4. **Multiply/divided the groups to determine the sign of the final expression.**

Name _____

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

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

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

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

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

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

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

Logarithms-<u>Solve & check</u>. 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 exact value 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**__

b) $\cos(5\pi/4)$ _____

c) $\tan(11\pi/6)$ _____

d) $\cot(22\pi/3)$ _____

e) $\sec(13\pi/2)$ _____

f) $\csc(-28\pi)$ _____

g) $\sin(41\pi/6)$ _____

h) $\cos(-7\pi/3)$ _____

i) $\tan(-19\pi/4)$ _____

j) $\sec(14\pi)$ _____

k) $\csc(13\pi/4)$ _____

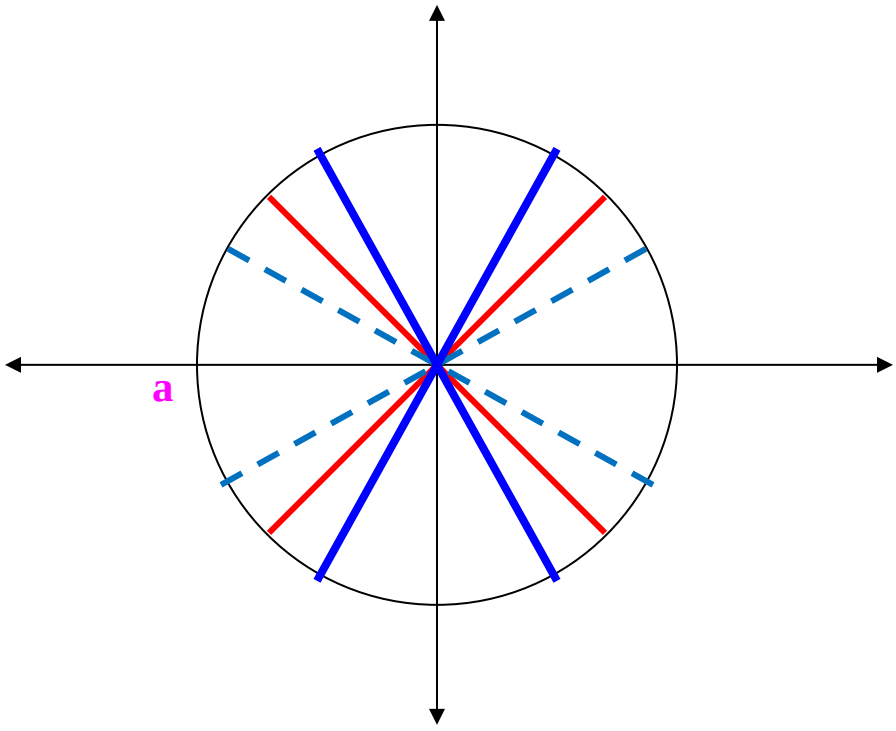
l) $\cot(19\pi/3)$ _____

m) $\tan(-17\pi)$ _____

n) $\sin(47\pi/3)$ _____

o) $\cos(-17\pi/6)$ _____

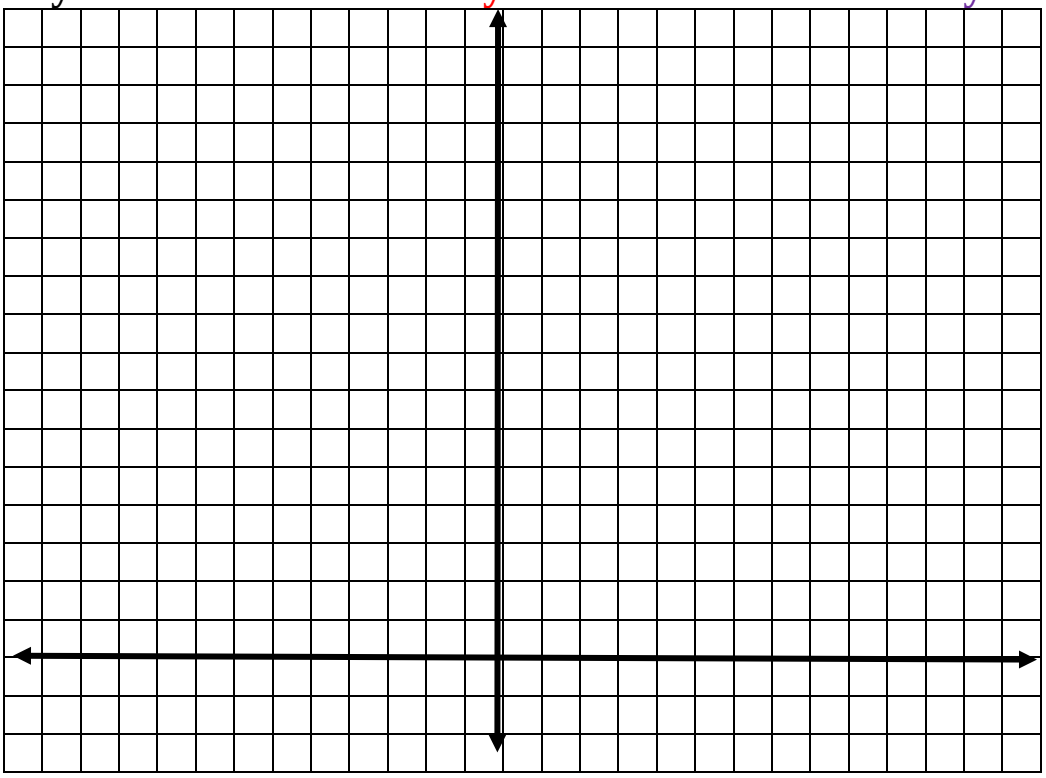
p) $\sin(-29\pi/4)$ _____



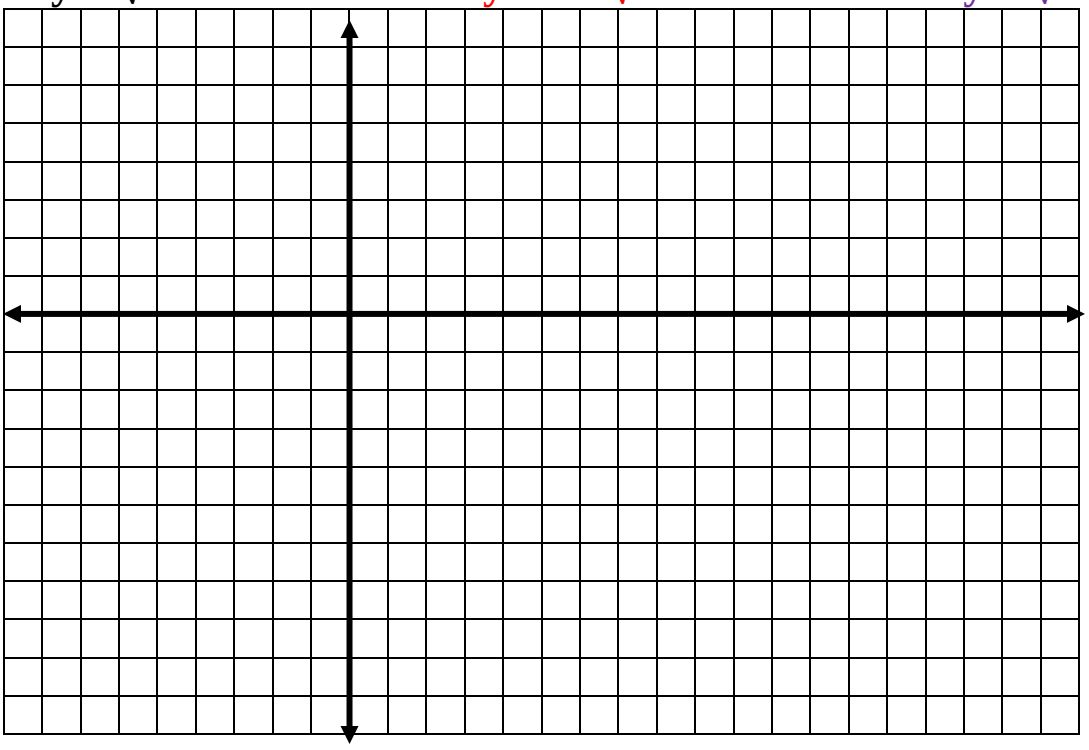
Graphing Functions **Name** _____

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

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

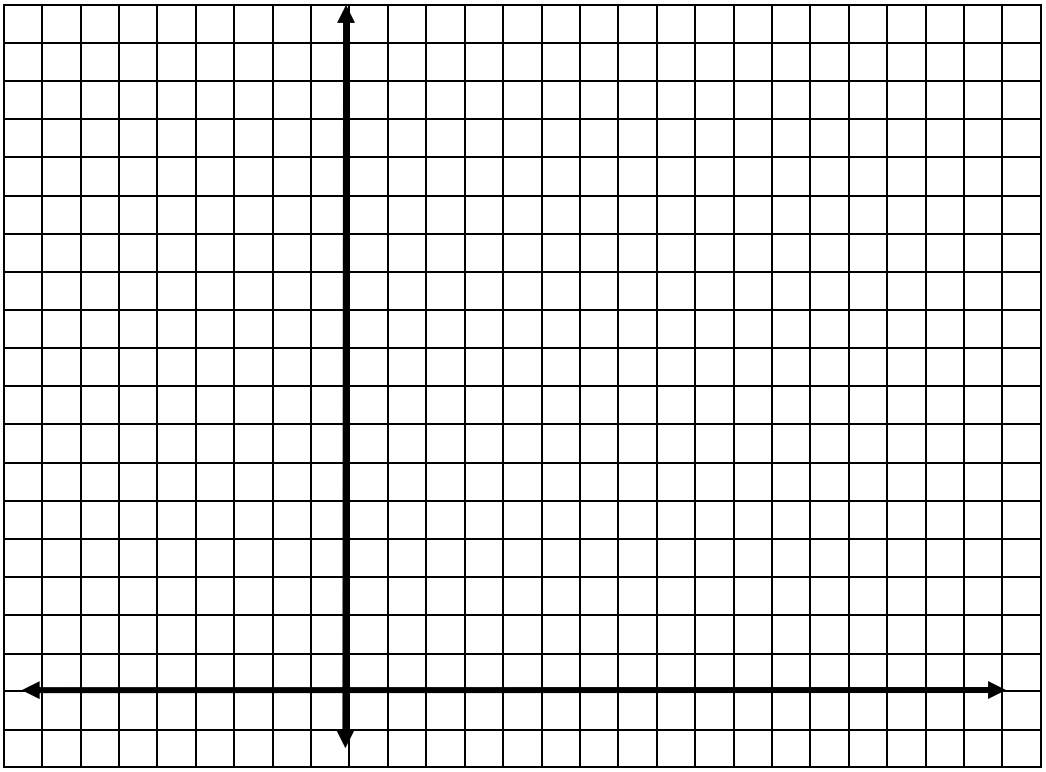


2. $y = \sqrt{x}$ $y = -3\sqrt{x}$ $y = \sqrt{x} + 3$

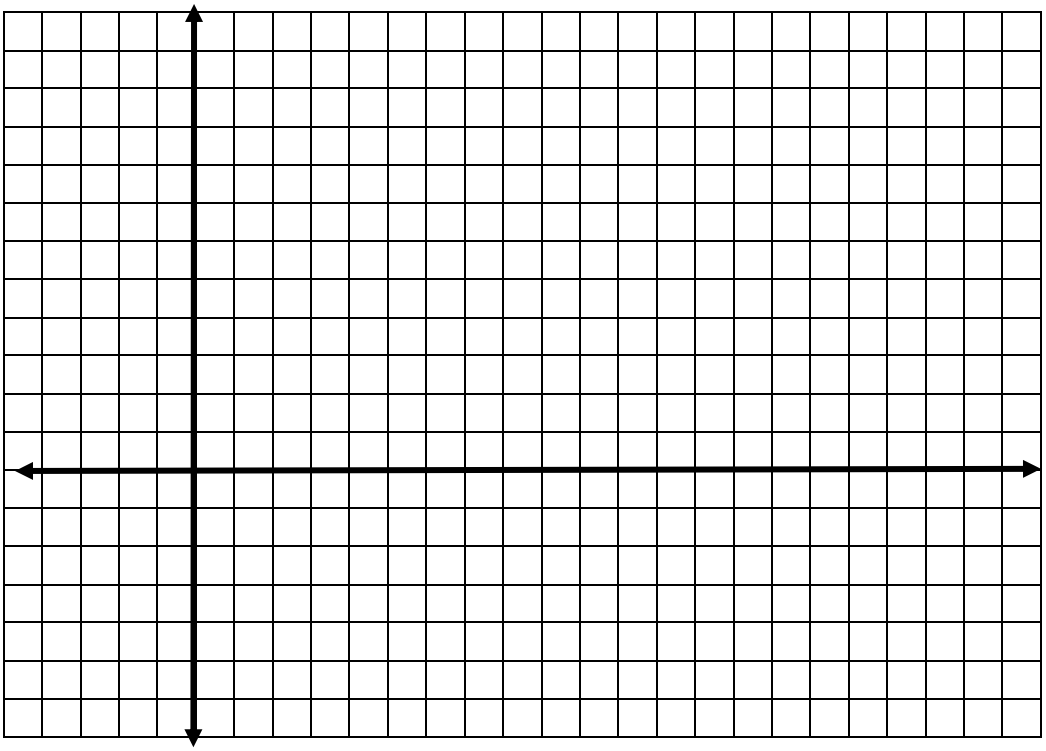


Name _____

3. $y = 2^x$ $y = 2^{x-1}$ $y = 2^x + 1$



4. $y = \log_2(x)$ $y = \log_2(x) + 3$ $y = \log_2(x - 3)$



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.)