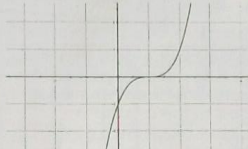
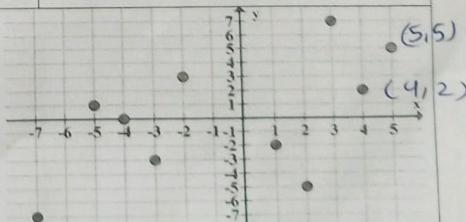


Questions #7
#42

Name: Key
Date: _____ Block: _____

Unit 2B Review - Linear Functions

What you need to know & be able to do	Things to remember	Examples																														
1. Determine if a relation is a function.	Every input only has one output (each 'x' only has one 'y') Use the vertical line test on graphs.	1. Determine if the graph is a function.  2. Determine if the table represents a function. <table border="1"> <tr><td>x</td><td>y</td></tr> <tr><td>-1</td><td>4</td></tr> <tr><td>0</td><td>5</td></tr> <tr><td>2</td><td>6</td></tr> <tr><td>-1</td><td>7</td></tr> </table> NO -1, 4 -1, 7	x	y	-1	4	0	5	2	6	-1	7																				
x	y																															
-1	4																															
0	5																															
2	6																															
-1	7																															
2. Create an input-output table for a function.	"x-y chart" - choose the x-values & plug them in	3. Create an input-output table for the function $f(x) = 2x - 3$. Use $x = -2, -1, 0, 1,$ and 2 . <table border="1"> <tr><td>x</td><td>f(x)</td><td>$f(x) = 2x - 3$</td></tr> <tr><td>-2</td><td>-7</td><td>$f(-2) = 2(-2) - 3$</td></tr> <tr><td>-1</td><td>-5</td><td>$f(-1) = 2(-1) - 3$</td></tr> <tr><td>0</td><td>-3</td><td>$f(0) = 2(0) - 3$</td></tr> <tr><td>1</td><td>-1</td><td>$f(1) = 2(1) - 3$</td></tr> <tr><td>2</td><td>1</td><td>$f(2) = 2(2) - 3$</td></tr> </table> 4. Create an input-output table for the function $f(x) = 6$. Use $x = -2, -1, 0, 1,$ and 2 . <table border="1"> <tr><td>x</td><td>f(x)</td></tr> <tr><td>-2</td><td>6</td></tr> <tr><td>-1</td><td>6</td></tr> <tr><td>0</td><td>6</td></tr> <tr><td>1</td><td>6</td></tr> <tr><td>2</td><td>6</td></tr> </table>	x	f(x)	$f(x) = 2x - 3$	-2	-7	$f(-2) = 2(-2) - 3$	-1	-5	$f(-1) = 2(-1) - 3$	0	-3	$f(0) = 2(0) - 3$	1	-1	$f(1) = 2(1) - 3$	2	1	$f(2) = 2(2) - 3$	x	f(x)	-2	6	-1	6	0	6	1	6	2	6
x	f(x)	$f(x) = 2x - 3$																														
-2	-7	$f(-2) = 2(-2) - 3$																														
-1	-5	$f(-1) = 2(-1) - 3$																														
0	-3	$f(0) = 2(0) - 3$																														
1	-1	$f(1) = 2(1) - 3$																														
2	1	$f(2) = 2(2) - 3$																														
x	f(x)																															
-2	6																															
-1	6																															
0	6																															
1	6																															
2	6																															
3. Evaluate functions.	f(x) function notation f(2) means you must substitute a '2' for every 'x' in the function!	5. Evaluate f(4). $f(x) = x^2 + 3x - 1$ $f(4) = 4^2 + 3(4) - 1$ $16 + 12 - 1$ $28 - 1$ $f(4) = 27$ 6. Find the value of $f(x) = 4x - 2$ when $x = -1$. $f(-1) = 4(-1) - 2$ $-4 - 2$ $f(-1) = -6$																														
		7. a. Find f(5). $f(5) = 5$ b. Find the value of x for $f(x) = 2$. $x = 4$ c. What is the maximum and minimum? Write in function notation. 																														

4. Write a function.

8.

Time Worked (h)	1	2	3	4
Amount Earned f(h)	5	10	15	20

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 5}{2 - 1} = \frac{5}{1}$$

$$y = mx + b \quad (1, 5) \quad m = 5$$

$$5 = (5)(1) + b$$

$$5 = 6 + b$$

$$b = -1$$

$$f(x) = 5x - 1$$

9.

x	1	2	3	4
y	-2	-1	0	1

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 0}{4 - 3} = \frac{1}{1}$$

$$y = mx + b \quad (3, 0) \quad m = 1$$

$$0 = (1)(3) + b$$

$$0 = 3 + b$$

$$b = -3$$

$$f(x) = x - 3$$

5. Create a function & use it to solve a problem.

10. You join a kickboxing class at a local gym. The cost is \$5 per class plus \$30 for the initial membership fee. Write a rule for the total cost of the class as a function of x. How much will it cost if you attend 7 classes?

$$f(x) = 5x + 30$$

$$f(7) = 5(7) + 30$$

$$f(7) = 35 + 30$$

$$f(7) = 65$$

11. Air Force One can travel 630 miles per hour. Let h be the number of hours traveled. Write a function rule that represents the total number of miles traveled. Then, determine how many miles Air Force One can travel in 4 hours.

$$f(h) = 630h$$

$$f(4) = 630(4)$$

$$f(4) = 2520$$

6. Calculate the average rate of change (slope).

"slope"

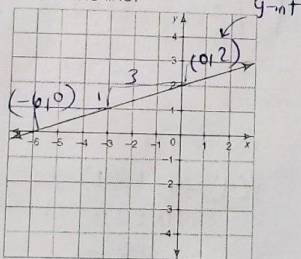
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Change in y
Change in x

$$m = \frac{2 - 0}{0 - (-6)} = \frac{2}{6} = \frac{1}{3}$$

$$b = 2$$

12. Calculate the slope. Then write the equation of the line.



$$y = \frac{1}{3}x + 2$$

13. Calculate the average rate of change between the following points on a line.

(0, 4) & (-3, 10)

$$\frac{10 - 4}{-3 - 0} = \frac{6}{-3} = -2$$

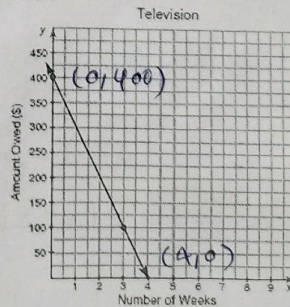
14. Calculate the slope. Give a labeled answer.

Number of Balloons	Total Cost of Balloons (in Dollars)
2	6
4	12
6	18
8	24

$$\frac{12 - 6}{4 - 2} = \frac{6}{2} = 3$$

$$m = 3$$

15. Calculate the slope. Give a labeled answer.



$$\frac{400 - 0}{0 - 4} = \frac{400}{-4} = -100$$

$$|m| = 100$$

Sitting Fee is 32

Calculate y-intercept

Point where graph crosses y-axis

(0, b)

16. Name the y-intercept:

x	0	1	3	4
y	8	6	2	0

(0, 8)

17. A photography studio charges \$50 that includes a sitting fee and 6 prints. Luigi increased his order to 11 prints and paid \$65. How much was the sitting fee?

$$\begin{array}{r} x \\ \text{6 prints} \\ \text{11 prints} \end{array} \quad \begin{array}{r} y \\ \$50 \\ \$65 \end{array}$$
y-int = 32

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{65 - 50}{11 - 6} = \frac{15}{5} = 3$$

$$y = mx + b \quad m = 3 \quad (\text{at } 50)$$

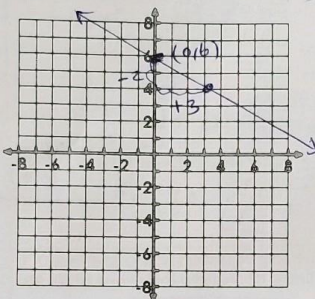
$$50 = 3(6) + b \quad 50 = 18 + b \quad \boxed{b = 32}$$

8. Graph a linear function

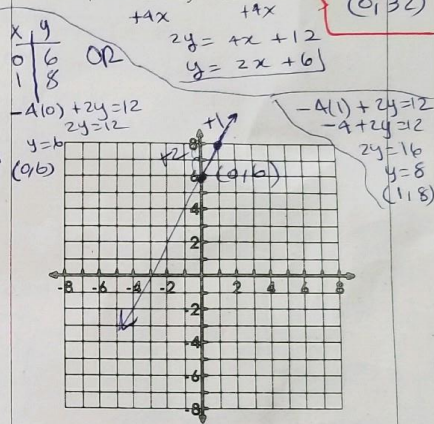
$$y = mx + b$$

*Always graph the y-intercept first and then use slope to determine next point.

18. Graph: $f(x) = -\frac{2}{3}x + 6$

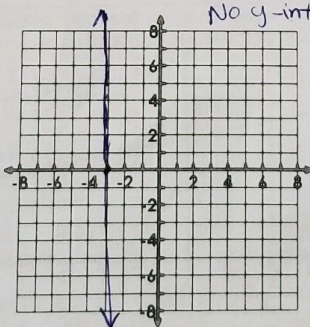


19. Graph: $-4x + 2y = 12$



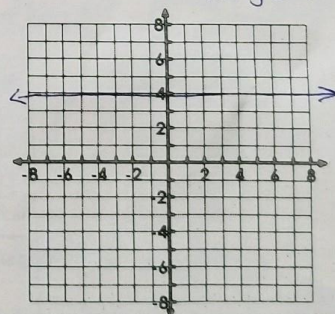
20. Graph $x = -3$. Name slope & y-intercept

undefined slope
No y-int



21. Graph $y = 4$. Name slope & y-intercept.

slope = 0
no y-int



9. Convert from standard to slope intercept form

Slope Intercept: $y = mx + b$

Standard: $Ax + By = C$

22. Solve for y: $4x + 2y = 8$

$$\begin{array}{r} -4x \quad -4x \\ 4x + 2y = 8 \\ \hline 2y = -4x + 8 \\ \frac{2y}{2} = \frac{-4x + 8}{2} \\ \hline y = -2x + 4 \end{array}$$

23. Determine the slope and y-intercept:

$$\begin{array}{r} 3x - 6y = -12 \\ -3x \quad -3x \\ \hline -6y = -3x - 12 \\ \frac{-6y}{-6} = \frac{-3x - 12}{-6} \\ \hline y = \frac{1}{2}x + 3 \end{array}$$

slope = $\frac{1}{2}$
y-int = 3

10. Convert from slope intercept to standard form

Slope intercept:
 $y = mx + b$
 Standard: $Ax + By = C$
 (no negative A values; multiply by -1 if necessary)

24. Put in standard form:
 $y = 3x + 4$

$$3x + y = y + 4$$

$$3x = y + 4$$

$$-y$$

$$\boxed{3x - y = -4}$$

$A=3 \quad B=-1 \quad C=-4$

25. Put in standard form:
 $y = -2/3x - 5$

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

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

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

$$A = -2 \quad B = -1 \quad C = 10$$

11. Write the equation of a line.

$y = mx + b$

26. Write the equation of the line that has a slope of $-\frac{1}{2}$ and contains the point (4, 6).

$$m = -\frac{1}{2} \quad (4, 6)$$

$$y = mx + b$$

$$6 = -\frac{1}{2}(4) + b$$

$$6 = -2 + b$$

$$+2 \quad +2$$

$$b = 8$$

Equation

$$\boxed{y = -\frac{1}{2}x + 8}$$

27. Write the equation of the line that contains the points (-2, 2) and (2, -6).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - 2}{2 - (-2)} = \frac{-8}{4}$$

$$m = -2$$

$$y = mx + b \quad m = -2 \quad (-2, 2)$$

$$2 = (-2)(-2) + b$$

$$2 = 4 + b$$

$$-4 \quad -4$$

$$b = -2$$

$$\boxed{y = -2x - 2}$$

28. Write the equation of the line that has a slope of 5 and y-intercept at (0, 3).

$$\boxed{y = 5x + 3}$$

29. Write the equation of the line that corresponds to the following table:

x	2	5	8	11
y	-6	-4	-2	0

$$m = \frac{0 - (-2)}{11 - 8} = \frac{2}{3} \quad \boxed{y = \frac{2}{3}x - \frac{16}{3}}$$

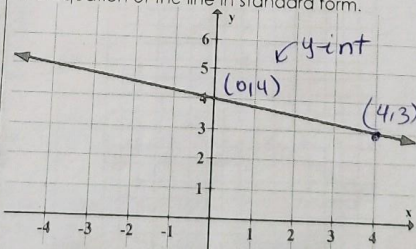
$$y = mx + b \quad m = \frac{2}{3} \quad (2, -6)$$

$$-6 = \frac{2}{3}(2) + b \quad -6 = \frac{4}{3} + b$$

$$-6 - \frac{4}{3} \quad -6 - \frac{4}{3}$$

$$b = -\frac{16}{3}$$

30. Write the equation of the line that corresponds to the graph below. Then write the equation of the line in standard form.



$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 4}{4 - 0} = \frac{-1}{4}$$

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

$$y = -\frac{1}{4}x + 4$$

$Ax + By = C$ is Standard Form

$$-\frac{1}{4}x + y = 4$$

$$-\frac{1}{4}x = 4 - y$$

$$-\frac{1}{4}x - 4 = -y - 4$$

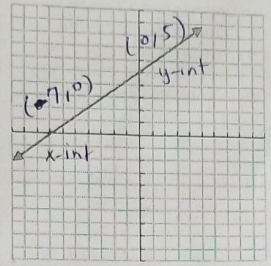
$$\boxed{\frac{1}{4}x + y = 4}$$

$A = \frac{1}{4} \quad B = 1 \quad C = 4$

Determine characteristics of linear functions

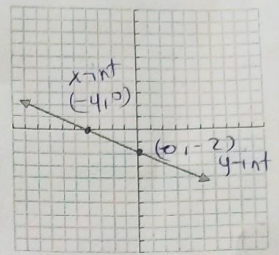
Domain: input, x-values, "left to right"
 Range - output, y-values, "bottom to top"
 x-intercept(s): where the graph crosses the x-axis.
 y-intercept(s): where the graph crosses the y-axis.
 maximum/minimum: the highest or lowest points.
 Increase: where the graph looks like it's going "up hill".
 Decrease: where the graph looks like it's going "down hill".
 Constant: where the graph is horizontal.
 End Behavior: "left side" $x \rightarrow -\infty$ "right side" $x \rightarrow \infty$
 What direction do the left and right arrows go?

31. Determine the domain & range of the function.



Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$
 Interval of Increase: $(-\infty, \infty)$
 Interval of Decrease: None
 Maximum: None Minimum: None
 End Behavior: As $x \rightarrow \infty$, $f(x) \rightarrow \infty$
 As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
 Zeros: $x = -7$ X-Intercept: $(-7, 0)$ Y-Intercept: $(0, 5)$

32. Determine the domain & range of the function.

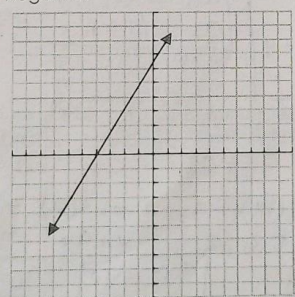


Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$
 Interval of Increase: None
 Interval of Decrease: $(-\infty, \infty)$
 Maximum: None Minimum: None
 End Behavior: As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$
 As $x \rightarrow -\infty$, $f(x) \rightarrow \infty$
 Zeros: $x = -4$ X-Intercept: $(-4, 0)$ Y-Intercept: $(0, -2)$

13. Determine where the graph is positive and negative

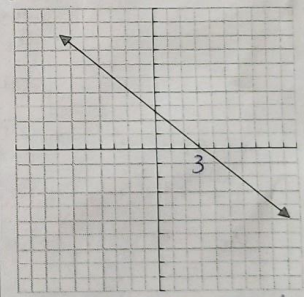
For what x-values is the graph in the positive (above x-axis) region and in the negative (below x-axis) region?

33. Give the inequality for the parts of the graph that are positive and negative.



Positive: $x > -4$ or $(-4, \infty)$
 Negative: $x < -4$ or $(-\infty, -4)$

34. Give the inequality for the parts of the graph that are positive and negative.



Positive: $x < 3$ or $(-\infty, 3)$
 Negative: $x > 3$ or $(3, \infty)$

14. Characteristics of functions without a graph.

X-intercept: $(a, 0)$
 Y-intercept $(0, b)$

35. Which functions have an interval of increase? How do you know?

A. $f(x) = 2x - 5$
 B. $f(x) = -\frac{1}{2}x + 4$
 C. $f(x) = -3x - 1$
 D. $f(x) = 3x + 9$
 A and D positive slope

36. What are the x and y intercepts for the equation $3x - 6y = 24$?

x-int $y = 0$ | y-int $x = 0$
 $3x - 6(0) = 24$ | $3(0) - 6y = 24$
 $3x = 24$ | $-6y = 24$
 $x = 8$ | $y = -4$
 $(8, 0)$ | $(0, -4)$
 x-int | y-int

15. Creating Equations from a Word Problem

Standard Form:
 $Ax + By = C$
 *Total
 *Two different amounts

 Slope Intercept Form:
 $y = mx + b$
 *Rate
 *Starting Amount/
 One Time Fee

37. Ed has \$36 to buy paints and brushes for a school project. Jars of paint cost \$4 each. The brushes are \$2 each. Write an equation to determine the combination of brushes and paint he can buy. If he buys 3 jars of paint, how many brushes can he buy?

$$4p + 2b = 36$$

$$4(3) + 2b = 36$$

$$12 + 2b = 36$$

$$-12 \quad -12$$

$$2b = 24 \quad (b = 12)$$

38. Gail orders CDs for \$8 each plus a total shipping cost of \$5. Write an equation to determine the total cost of purchasing CDs. If Gail spent \$53, how many CDs did she order?

y : total cost, x : # of cd

$$y = 8x + 5$$

$$53 = 8x + 5$$

$$-5 \quad -5$$

$$48 = 8x$$

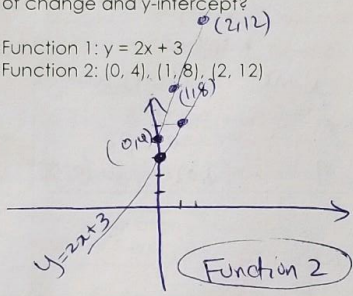
$$x = 6$$

16. Comparing Linear Functions

Determine what the slope and y-intercepts are and interpret them in a real world context before comparing.

39. Which function has the greater rate of change and y-intercept?

Function 1: $y = 2x + 3$
 Function 2: $(0, 4), (1, 8), (2, 12)$



40. The table to the right shows the distance (in meters) Runner A and Runner B ran at different time intervals. Which runner has a faster average speed from 20 to 31 seconds?

Time	Runner A	Runner B
0	0	0
9	120	120
20	168	213
31	287	287

Runner A: $\frac{287 - 168}{31 - 20} = \frac{119}{11}$

Runner B: $\frac{287 - 213}{31 - 20} = \frac{74}{11}$

17. Arithmetic Sequences

Explicit form:
 $a_n = a_1 + (n-1)d$

 Recursive form:
 $a_1 =$
 $a_n = a_{n-1} + d$

41. Write the EXPLICIT and RECURSIVE formula for the following sequence:

5, 9, 13, 17...

Recursive
 $a_1 = 5$
 $a_n = a_{n-1} + 4$

$a_n = a_1 + (n-1)d$
 $a_n = 5 + (n-1)4$
 $a_n = 4n + 1$
 Explicit

42. Write the EXPLICIT and RECURSIVE formula for the following sequence:

-3, -9, -14, -19...

$-3 - 6 = -9$
 $-9 - 5 = -14$
 $-14 - 5 = -19$
 Not a constant difference

-3, 0, 3, 6
 $+3 \quad +3 \quad +3$
 $a_n = -3 + 3(n-1)$
 $-3 + 3n - 3$
 $a_n = -6 + 3n$

43. Given the sequence -3, 0, 3, 6... find the following term values:

$a_{19} =$
 $a_{19} = -6 + 3(19)$
 $-6 + 57$
 $a_{19} = 51$

$a_{32} =$
 $a_{32} = -6 + 3(32)$
 $-6 + 96$
 $a_{32} = 90$

44. Given the sequence 7, 15, 23, 31... find the following term values:

$a_6 =$
 $-1 + 8(6)$
 $-1 + 48$
 $a_6 = 47$

$a_{24} =$
 $-1 + 8(24)$
 $-1 + 192$
 $a_{24} = 191$

45. Determine the first four terms of the sequence:

$a_1 = 7$
 $a_n = a_{n-1} - 3$
 $\{7, 4, 1, -2, \dots\}$

46. Determine the first four terms of the sequence:

$a_1 = -4$
 $a_n = a_{n-1} + 5$
 $\{-4, 1, 6, 11, \dots\}$