Name: MS. KOROTKOW 2015-2016

FORMS OF LINEAR EQUATIONS

Algebra I Unit 3

Slope - Intercept Form

$y = mx + b$

m = slope
(move & make points)
b = y-intercept
(where you begin)

* can plug into calculator!

Point - Slope Form

$y - y_1 = m(x - x_1)$

point on line
(x_1, y_1)
m = slope

METHOD 1 $y=mx+b$
solve for y to convert to slope-intercept

METHOD 2
① x-int $(x,0)$ cover up y
② y-int $(0,y)$ cover up x

Standard Form

$Ax + By = C$

A, B, C are whole #s

INEQUALITIES

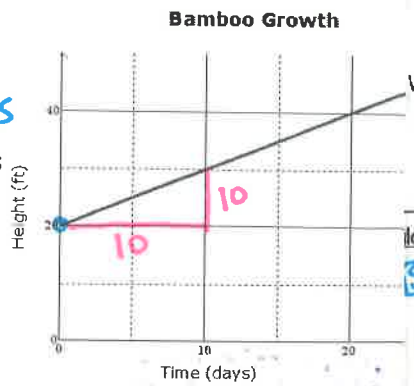
	UP	DOWN
dotted	$>$	$<$
solid	$\geq$	$\leq$

10/5/15

SLOPE-INTERCEPT FORM

Essential Question: How do I write an equation given a slope and a y-intercept?

Bamboo can grow very quickly. The graph models the growth of a bamboo plant.



1. What is the y-intercept? What does this tell you about the bamboo plant?

crosses y-axis

(0,20)

The bamboo plant was 20 feet tall at the beginning

2. What is the slope of the line? What does it tell you about the bamboo plant?

$m = \frac{RISE}{RUN} = \frac{10 \text{ feet}}{10 \text{ days}} = 1$

The plant grows 1 foot every day.

3. What is the equation of this line? Write a complete statement about the bamboo plant and the equation of the line.

$y = mx + b$

$m = 1$
$b = 20$

$y = 1x + 20$

4. How many days will it take the plant to grow to 60ft? Explain how you got this answer.

$60 = x + 20$
$-20 \quad -20$

40 days

5. Create a table of 3 solutions of the bamboo plant growth. Describe what one point represents.

days, height

x	y
10	30
20	40
30	50

At 30 days, the plant is 50 feet tall!

Slope Intercept Form

$$y = mx + b$$

SLOPE — Move & Make points

y-intercept — Beginning

$y = mx + b$

slope / rate of change

What are the slope and y-intercept of the graph of the linear function $y = 5x - 2$? What is the rate of change of the function?

$m = 5 \quad b = -2 \quad$ yint $(0,-2)$

rate of change!

Remember: Rate of Change means... SLOPE!

What is an equation of the line with slope $-\frac{4}{5}$ and a y-intercept of 7?

$y = -\frac{4}{5}x + 7$

Calculator Short Cut...

STAT 1:Edit...

x's → L_1
y's → L_2

STAT ▶CALC

4: LinReg

CALCULATE

TA-DA!

8. Refer to the function represented in the table below.

x	y
-2	9
-1	7
0	5
1	3
2	1

+1 +1 +1 ; -2 -2 -2

a. What is the slope?

$m = \frac{\Delta y}{\Delta x} = \frac{-2}{1}$

b. What is the y-intercept? when $x = 0$

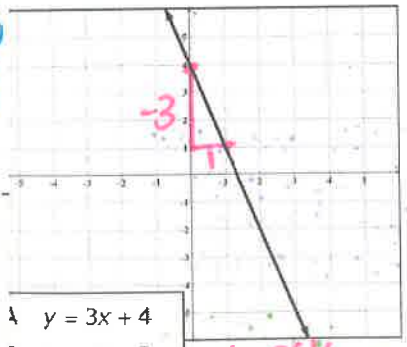
$(0,5)$

c. What is the equation written in slope-intercept form?

$y = mx + b$

$y = -2x + 5$

Which equation represents the line graphed below?



A $y = 3x + 4$
B $y = 4x + 3$
C $y = -3x + 4$
D $y = 4x - 3$

check choices in calc!

10. A plumber charges a $65 fee for a repair plus $35 per hour. Write an equation to model the total cost y of a repair that takes x hours.

per = slope

$y = 65 + 35x$

Find a point on your line. Write a complete statement describing what one point means for the plumber.

$(1, 100)$

For 1 hour, the cost is $100

10/6/15

3

Direct Variation

Essential Question: How do I write the equation of two variables that vary directly?

Direct Variation - proportional relationship where $y=kx$

Constant of Proportionality - nonzero constant (number)

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

BASICALLY, Direct Variation is an equation in slope-intercept form ($y=mx+b$) where m = k and b = 0

goes thru origin!

Identify if each of the following is an example of direct variation. If so, identify the constant of variation. solve for y

1. $y = 4x$

$\boxed{\text{Yes. } k=4}$

2. $2x + y = 10$

$-2x \quad -2x$

$y=-2x+10$

$\boxed{\text{NO}}$ $b \neq 0$

3. $-3x + 5y = 0$

$+3x \quad +3x$

$\frac{5y}{5}=\frac{3x}{5}$

$y=\frac{3}{5}x$

$\boxed{\text{Yes, } k=\frac{3}{5}}$

4. Y varies directly with x, and y is 84 when x is 16.

$y=kx$ plug in $y=84$, $x=16$

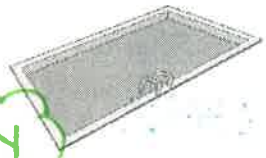
$\frac{84}{16}=\frac{k(16)}{16}$

A. What is the constant of variation?

$k=5.25$

B. Write a direct variation equation to represent this situation.

$y=5.25x$



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

5. The amount of chlorine, c, needed for a swimming pool var directly with the amount of water, w, needed to fill the po If 16 units of chlorine are needed for every 1250 gallons water, write an equation that represents this situation.

$y=kx$

$c=kw$

$c=16$ $w=1250$

$\frac{16}{1250}=\frac{k\cdot 1250}{1250}$

$0.0128=k$

$\boxed{c=0.0128w}$

6. If y is directly proportional to x and $y=8$ when $x=10$, what is the value of y when $x=5$?

$\boxed{y=4}$

W	O	N
X	10	5
Y	8	Y

$10y=40$

$y=4$

10/7/15

4

SLOPE-INTERCEPT FORM INEQUALITIES

Essential Question: How do I graph an inequality in 2 variables?

Solution Set: · any point that makes the inequality true · lies in shaded region - NOT on dotted line!

Identify three solutions to the linear inequality.

$y > x - 3$

x	y
0	3
2	6
8	7

etc

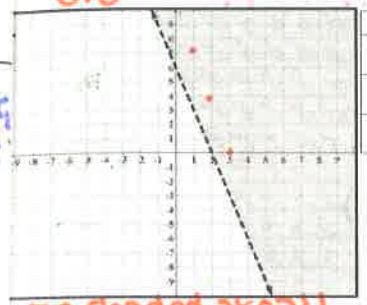
B. You are buying paperback and ebooks from Books-A-Trillion. Paperback books are $4.50 each and ebooks are $2.50 each. You can spend at most $20. What are the possible combinations of paperback and ebooks you can buy?

PAPERBACK · E BOOK

x	y
0	0
1	1
2	2

etc

Lots of possible answers



x	y
3	0
2	4
1	7

etc

In shaded area!!

If y is on the left...

	Shade Up	Shade Down
Dotted	$>$	$<$
Solid	$\geq$	$\leq$

To Graph or Write Linear Inequalities

solve for y

Name m (slope) and b (y-intercept)

Plot b and use m to make more points

Decide: dotted or solid? Shade up or down?

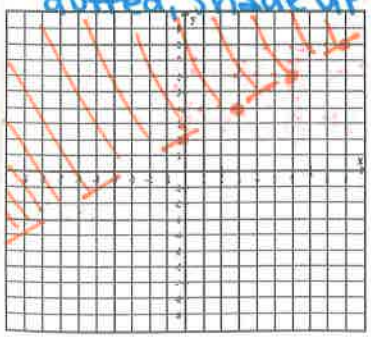
up > down <

RISE/RUN = m

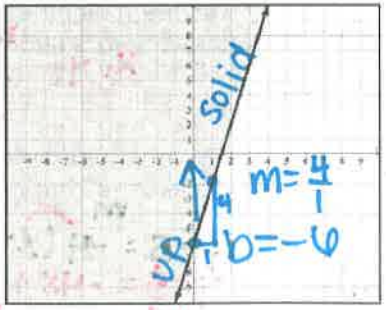
$m=\frac{2}{3}$ up 2 right 3 $b=2$

Graph $y>\frac{2}{3}x+2$ below.

dotted, shade up



3. Write the linear inequality that represents the graph



$y \geq 4x-6$

* See Kahoot for extra practice! *

10/8/15

POINT-SLOPE FORM

Essential Question: How do I write the equation of a line given a point (not the y-int) and a slope?

$$y - y_1 = m(x - x_1)$$

slope

point (x_1, y_1)

"If I see a number, I put a number in its place"

Use this equation when.....they give you a slope and a point that's NOT the y-intercept.

1. Write an equation that represents a line having a slope of 2 that passes through the point (7, 2). Write your equation in **point-slope form**.

m

x_1 y_1

LABEL!

$y - 2 = 2(x - 7)$

2A. Use the point-slope equation from #1. Solve for y.

$y - 2 = 2(x - 7)$

$y - 2 = 2x - 14$

$+2 \quad +2$

$y = 2x - 12$ ← slope intercept form!

$y = mx + b$

2B. What is the relationship between **point-slope form** of an equation and **slope-intercept form**?

Both have x, y, and the slope.

Plug in what you know!!

$y = mx + b$

solve $y - y_1 = m(x - x_1)$ for y

3. Write an equation in **point-slope form** of a line having a slope of $\frac{3}{2}$ that passes through the point (-4, 1).

m

x_1 y_1

$y - 1 = \frac{3}{2}(x - -4)$

$y - 1 = \frac{3}{2}(x + 4)$

4. Write an equation in **slope-intercept form** having a slope of -4 that passes through the point (1, 5).

m

x_1 y_1

$y - 5 = -4(x - 1)$

$y - 5 = -4x + 4$

$+5 \quad +5$

$\boxed{y = -4x + 9}$

H O Y = equation

H: horizontal

O: (zero) slope

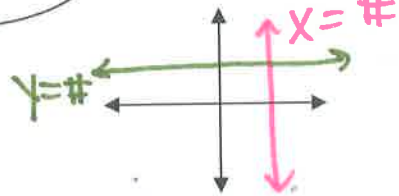
Y: equation

V U X = equation

V: Vertical

U: Undefined slope

X: equation



How do I write equations of horizontal or vertical lines?

5. Write an equation of a line having an undefined slope that passes through the point (5, -3)

x y

VUX

vertical $x = 5$

6. Write an equation of a line having a slope of 0 that passes through the point (-3, 4).

x y

HOY

$y = 4$

7. Write an equation in **slope-intercept form** that represents a line with a slope of 2 and an *x*-intercept of 5.

m

(5, 0)

x_1 y_1

$y - 0 = 2(x - 5)$

$y = 2x - 10$

HINT: "b" means... y-intercept

8. A repairperson charges $25.00 per hour plus an initial service-call charge. The bill for 3 hours was $105.00.

A. In the problem, what is the slope? m = 25

B. What information would be a point on the equation of this situation?

(3, 105)

hours charge

C. What does this point represent? at 3 hours, it costs $105

D. Write an equation in **point-slope form** that represents this situation where *h* is the number of hours and *c* is the total charges.

x y

$c - 105 = 25(h - 3)$

$c - 105 = 25h - 75$

$+105 \quad +105$

$c = 25h + 30$

E. What was the initial service-call charge?

solve for c

y-int (b)

$30

F. What will be the bill for 7 hours?

$c = 25(7) + 30$ $205

10/13/15

POINT-SLOPE FOR INEQUALITIES

Essential Question: How do I graph inequalities given in point-slope form?

REMEMBER: $y - y_1 = m(x - x_1)$

	Shade Up	Shade Down
Dotted	$>$	$<$
Solid	$\geq$	$\leq$

Slope is m

Point is (x_1, y_1)

To graph the boundary line for a point slope equation:

1. Start at the point (x_1, y_1)
2. Using the slope, count the rise and run, plot the next point. move & make new points!
3. Determine whether to draw a dashed or solid line.
4. If y is on the LEFT, use the shading chart! Or you can test points. up > down

Graph each inequality. Determine which point is a solution to the inequality.

1. $y - 1 \geq 2(x - 4)$ (y_1, x_1, m)

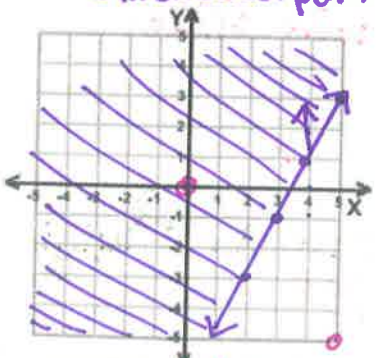
point: (4,1)

$m = \frac{2}{1}$ up2 right1

· solid
· up

(5,-5) (0,0) ✓

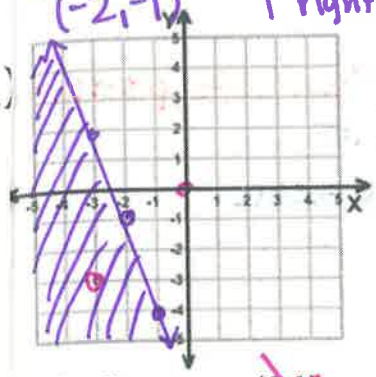
☆ in shaded part



extend the line as far as you can!

2. $y + 1 \leq -3(x + 2)$ · solid · down

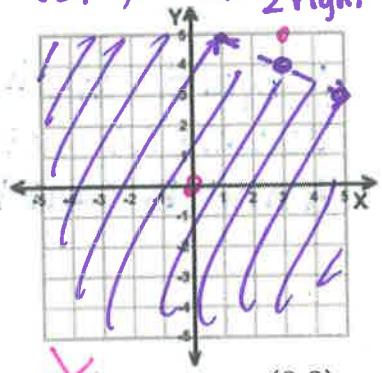
point (-2,-1) $m = \frac{-3}{1}$ down right



(-3, -3) ✓ (0,0)

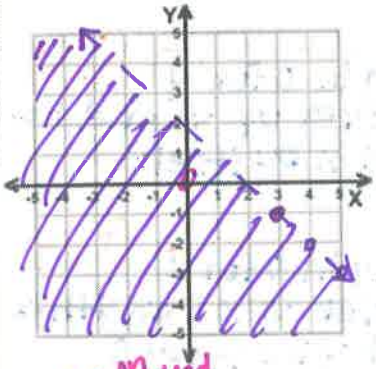
3. $y - 4 < -\frac{1}{2}(x - 3)$ · dotted · down

(3,4) $m = \frac{-1}{2}$ down right



(3,5) (0,0) ✓

4. $y + 1 < -1(x - 3)$

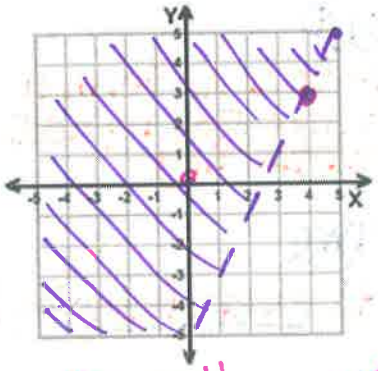


(3,-1) on dotted line! (0,0) ✓

point (3,-1) $m = \frac{-1}{1}$ down right

· dotted
· down

5. $y - 3 > 2(x - 4)$



(4,3) dotted! (0,0) ✓

point (4,3) $m = \frac{2}{1}$ up right

· dotted
· up

10/15/15

9

Standard Form Equations

Essential Question: How can I find the slope, x-int, and y-int and graph an equation in standard form?

$$Ax + By = C$$

1. A, B, and C are integers (whole #s, pos or neg)
2. Usually A is not negative
3. A and B can't both be zero.

METHOD 1
CONVERT

solve for y

$y = mx + b$ ← slope ← y-int

STEP ONE

Move your Ax term to the other side by adding or subtracting

STEP TWO

Divide everything by B

STEP THREE

Graph the y-intercept on the y-axis and use the slope (m) to make another point.

METHOD 2
COVER

COVER UP method

1. To find the x-intercept (x, 0)
   Plug in 0 for y (cover up y) and then get x by itself
2. To find the y-intercept (0, y)
   Plug in 0 for x (cover up x) and then get y by itself
3. Graph your intercepts and connect the dots!

METHOD 1

Convert to slope-intercept form and graph.

$3x - 5y = 15$

ONLY COMBINE LIKE TERMS

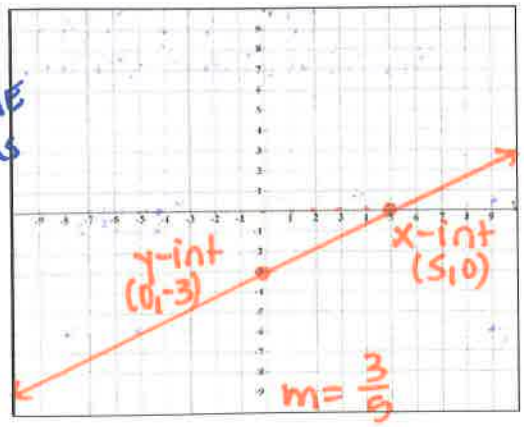
① $-3x \quad -3x$

$\frac{-5y}{-5} = \frac{-3x}{-5} + \frac{15}{-5}$

② $y = \frac{3}{5}x - 3$

③ $m = \frac{3}{5}$ up right

$b = -3$



METHOD 2

Find and graph x- and y-intercepts.

$3x - 5y = 15$

① x-int: $3x = 15$

$\frac{3x}{3} = \frac{15}{3}$

$x = 5$

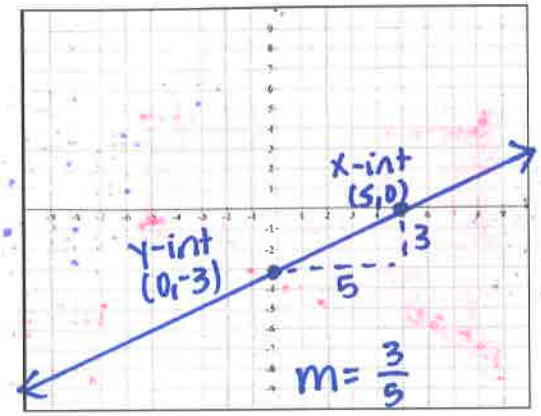
(5,0)

② y-int: $-5y = 15$

$\frac{-5y}{-5} = \frac{15}{-5}$

$y = -3$

(0,-3)



Plug in points!!

STAAR question!

4. What is the equation in standard form of the line that passes through the point (4, −8) and has a slope of $\frac{1}{4}$?

$x - 4y =$

$4 - 4(-8) = 36$

x y

POINT has x & y, so does your equation!

A $x - 4y = 36$

B $x - 4y = 28$

C $x - 4y = -36$

D $x - 4y = -28$

we could solve all of them for y ... but notice how only the right side is different!

10/16/15

Standard Form Inequalities

Essential Question: How do I graph an inequality in standard form?

To Graph Linear Inequalities

- Solve your inequality for y. Be careful if you divide by a negative! FLIP!
- Name your slope (m) and y-intercept (b).
- Plot your y-intercept (where you Begin) and use your slope to Make More points.
- Decide if your line is dotted or solid.
- Connect the dots & shade!

	Shade Up	Shade Down
Dotted	$>$	$<$
Solid	$\geq$	$\leq$

1. Graph the inequality $2x - 4y \leq 8$

solve for y

$-2x \quad -2x$

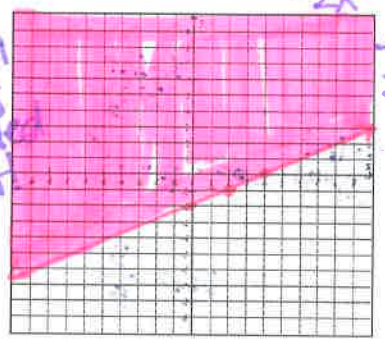
$\frac{-4y}{-4} \leq \frac{-2x}{-4} + \frac{8}{-4}$ FLIP all the signs!

$y \geq \frac{1}{2}x - 2$

$m = \frac{1}{2}$

$b = -2$

$\geq$ · up · solid



Solution set is in shaded part

2. Graph the inequality $8x + 4y > 12$

$-8x \quad -8x$

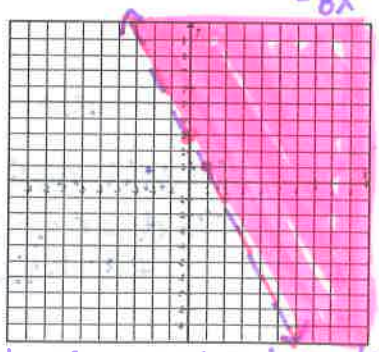
$\frac{4y}{4} > \frac{-8x}{4} + \frac{12}{4}$

$y > -2x + 3$

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

$b = 3$

$>$ · dotted · up



Solutions are not on dotted line!

Blanca has $40 to spend on refreshments for herself and her friends at the movie theater. The equation $5x + 2y < 40$ describes the number of large popcorns, x, and small drinks, y, she can buy. Use this information to answer the following questions.

3. What is the slope of the equation used to model this situation?

solve for y!

$5x + 2y < 40$

$-5x \quad -5x$

$\frac{2y}{2} < \frac{-5x}{2} + \frac{40}{2}$

$y < \boxed{\frac{-5}{2}}x + 20$

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

4. What is the y-intercept? What does it mean in this scenario?

where x=0

$\frac{5x}{2} + \frac{2y}{2} < \frac{40}{2}$

$y < 20$

She can buy at most 20 drinks if she buys no popcorn.

5. What is the x-intercept? What does it mean in this scenario?

where y=0

$\frac{5x}{5} + \frac{2y}{5} < \frac{40}{5}$

$x < 8$

She can buy at most 8 popcorns if she buys no drinks

6. What does the point (2, 6) mean in this situation? Does this point represent a solution to Blanca's situation? Explain your reasoning.

x y

x = 2 popcorn

y = 6 drinks

$5(2) + 2(6) < 40$?

$22 < 40$ ✓

$\boxed{\text{Yes, less than \$40}}$

7. What does the point (6, 5) mean in this situation? Does this point represent a solution to Blanca's situation? Explain your reasoning.

6 popcorn

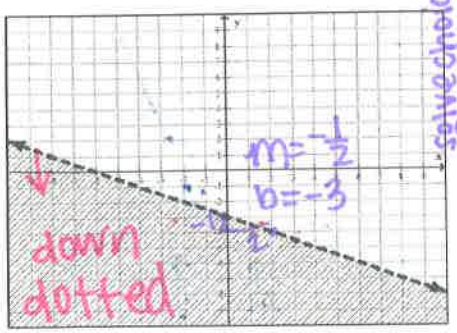
5 drinks

$5(6) + 2(5) < 40$?

$40 < 40$ ✗

$\boxed{\text{NO,}}$

8. Which equation can be represented by the graph shown below?



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

$b = -3$

down

dotted

$<$

solve choices for y

A $-5x + 10y + 30 > 0$

B $5x - 10y + 30 > 0$

C $\boxed{-5x - 10y - 30 > 0}$

D $5x + 10y - 30 > 0$

10/19/15

13

Strategies for Graphing Equations

You can always solve an equation for y and check in your calculator!

14

Essential Question: How do I graph an equation in any form?

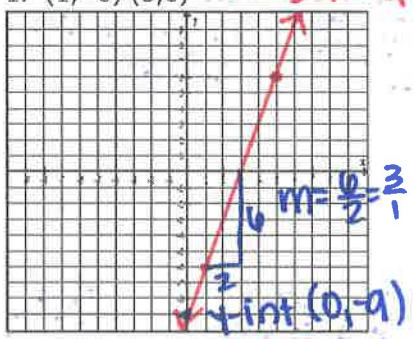
Lines reminders!

- You need at least 2 points to make a line!
- Slope = $\frac{\text{RISE}}{\text{RUN}} = m$
- You Begin at the y-intercept (b) (y-axis)
- To find x-intercepts, cover up y
- To find y-intercepts, cover up x

use a straightedge!

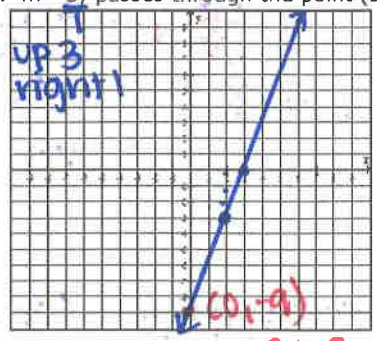
Given the following information, graph each equation and write the equation in slope-intercept form.

1. (1, -6) (5,6) $x_1\ y_1\ x_2\ y_2$ $m = \frac{6+6}{5-1} = \frac{12}{4} = \frac{3}{1}$



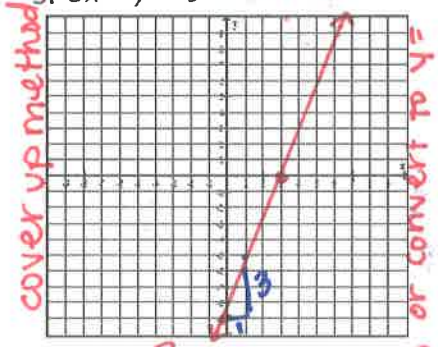
Slope-intercept form: y= $3x-9$

2. m= 3; passes through the point (2,-3)



Slope-intercept form: y= $3x-9$

3. $3x - y = 9$



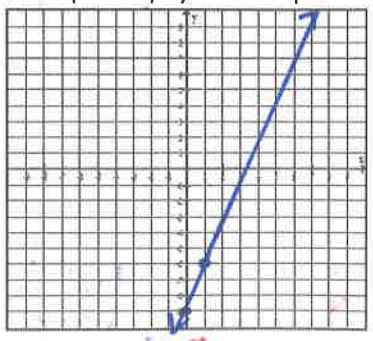
x-int: (3,0) y-int: (0, -9)

$\frac{3x}{3} = \frac{9}{3}$ $\frac{-y}{-1} = \frac{9}{-1}$

$x = 3$ $y = -9$

Slope-intercept form: y= $3x-9$

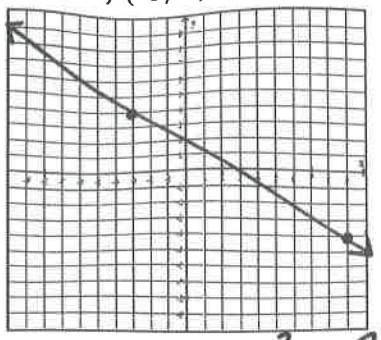
4. Slope: 3; y-intercept: -9



$y = 3x - 9$

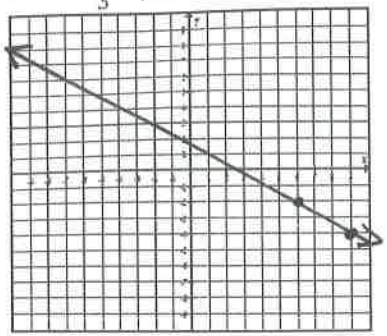
m b

5. (9, -4) (-3, 4) see #1



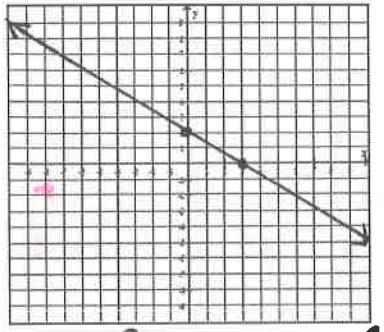
Slope-intercept form: y= $-\frac{2}{3}x+2$

6. $m = -\frac{2}{3}$; passes through the point (6,-2) see #2



Slope-intercept form: y= $-\frac{2}{3}x+2$

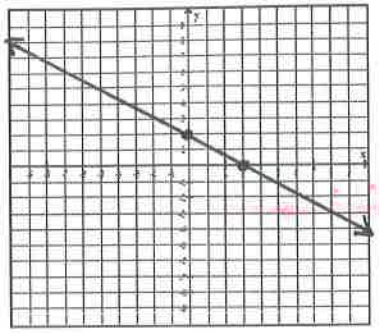
7. $2x + 3y = 6$ see #3



x-int: (3,0) y-int: (0, 2)

Slope-intercept form: y= $-\frac{2}{3}x+2$

8. Rate of change: $-\frac{2}{3}$; y-intercept: 2 see #8



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

Summary...

If they give me 2 points.....
- STAT edit.
- use slope formula or count $\frac{\text{rise}}{\text{run}}$
- plot more points (or connect with a straight line) to find y-intercept.

If they give me a point and a slope.....
- use point-slope form ($y-y_1 = m(x-x_1)$) & solve for y
- plot point & use m to find y intercept

If they give me an equation.....
which form do I have?
- $y-y_1 = m(x-x_1)$ ← plot point, use m
- $y = mx+b$ ← name m & b
- $Ax+By=C$ ← cover up method or convert to $y=mx+b$

STAAR ALGEBRA I REFERENCE MATERIALS

FACTORING	
Perfect square trinomials	$a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$
Difference of squares	$a^2 - b^2 = (a - b)(a + b)$

PROPERTIES OF EXPONENTS	
Product of powers	$a^m a^n = a^{(m+n)}$
Quotient of powers	$\frac{a^m}{a^n} = a^{(m-n)}$
Power of a power	$(a^m)^n = a^{mn}$
Rational exponent	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$
Negative exponent	$a^{-n} = \frac{1}{a^n}$

LINEAR EQUATIONS	
Standard form	$Ax + By = C$
Slope-intercept form	$y = mx + b$
Point-slope form	$y - y_1 = m(x - x_1)$
Slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$

QUADRATIC EQUATIONS	
Standard form	$f(x) = ax^2 + bx + c$
Vertex form	$f(x) = a(x - h)^2 + k$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Axis of symmetry	$x = \frac{-b}{2a}$