Name Key Ault

Day	Date	Assignment (Due the next class meeting)
Wednesday Thursday	9/4/19 (A) 9/5/19 (B)	• Ch 1 Test Corrections in class • 2. 1 Worksheet
Friday Monday	9/6/19 (A) 9/9/19 (B)	• 2.2 Worksheet
Tuesday Wednesday	9/10/19 (A) 9/11/19 (B)	• 2.3: Pages 72 – 74; #12, 15 – 26, 29 – 34, 41, 42 **Bonus: #44**
Thursday Friday	9/12/19 (A) 9/13/19 (B)	• 2.4: Pages 80 – 82; #11, 15 – 28, 32, 33 **Bonus: #12** For #15, 16, 18, 20, 21, 23: write your answers in slope-intercept form.
Monday Tuesday	9/16/19 (A) 9/17/19 (B)	• Ch 2 Practice Test • Study!
Wednesday Thursday	9/18/19 (A) 9/19/19 (B)	• In class: **Ch 2 Test** • HW: none ☺

NOTE: Be prepared for daily quizzes.

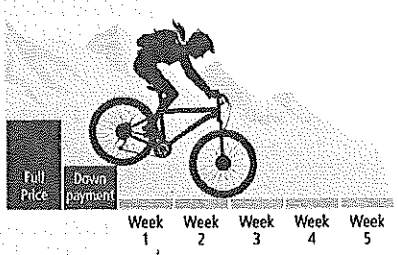
Students with 100% homework completion AND no late/missing homework for the semester will be rewarded with a pizza party. Students with 100% homework completion and no missing homework for the semester will get a 2% grade increase.

Do you need a worksheet or a copy of the teacher notes? Go to www.washoeschools.net/DRHSmath

1. *Online textbook information:* Go to www.washoeschools.net
   - Click on Student and Parent
   - Click on Envision
   - Click on Sign In – sign in using washoe\studentID#, and then your school computer password. (Note: use a back slash not a forward slash.)

2.1 Notes: Slope-Intercept Form

Exploration: Alani wants to buy a $360 bicycle. She is considering two payment options. The image shows Option A, which consists of making an initial down payment of $70 and then 5 smaller, equal-sized weekly payments until she has paid a total of $360. Option B consists of making 6 equal payments over 6 weeks in order to pay a total of $360.



A) What factors should Alani take into consideration before deciding which option to choose? How much can she afford to pay each week? How much can she pay up-front?

B) How much would Alani have to pay for each weekly payment with option A? Write an equation to model the amount paid A after m months.

$360 - 70 = 290$

$290 \div 5 =$ \$58 each week

$A = 58m + 70$

Key Vocabulary

Slope of a line (m) — positive slope / negative slope

$m = \frac{\text{rise}}{\text{run}}$ = "rate of change" → "slant" of a line

Slope-Intercept Form

$y = mx + b$

m → slope; b → y-int

y-intercept of a line $(0, b)$

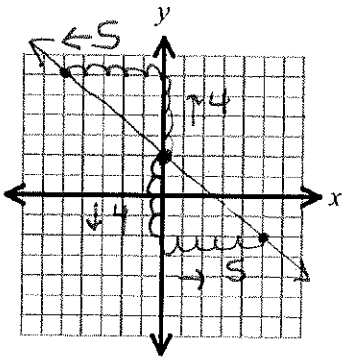
* where a line crosses the y-axis
* the "beginning" point of a line

Example 1: Find the slope and y-intercept of the line $y = -\frac{4}{5}x + 2$. Then graph the line on the coordinate system provided.

$m = \frac{-4\downarrow}{5\rightarrow}$ or $\frac{\uparrow 4}{\leftarrow 5}$

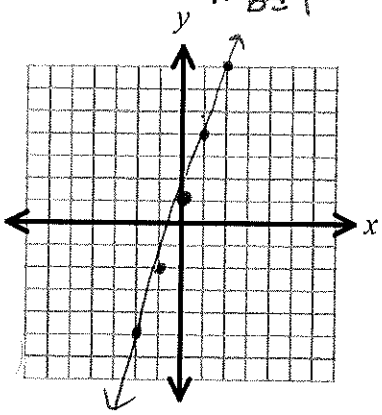
★ $b = 2$

Start here on y-axis

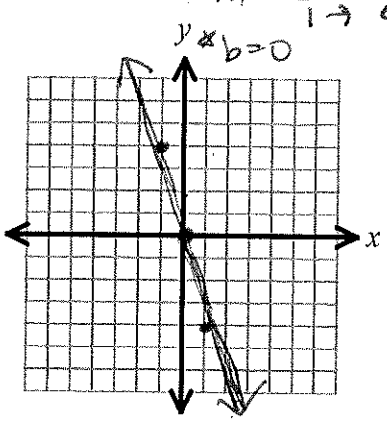


You try! Example 2: Find the slope and y-intercept of each line below. Then graph teach line.

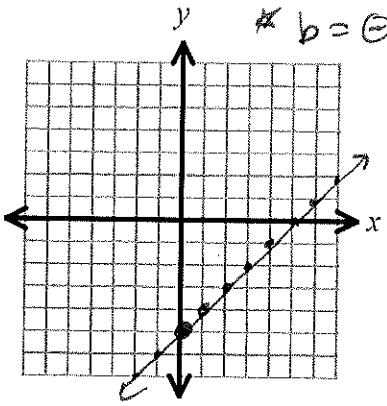
a) $y = 3x + 1$ $m = \frac{3\uparrow}{1\rightarrow}$ or $\frac{\downarrow 3}{\leftarrow 1}$ ★ $b = 1$



b) $y = -4x + 0$ $m = \frac{-4\downarrow}{1\rightarrow}$ or $\frac{\uparrow 4}{\leftarrow 1}$ ★ $b = 0$

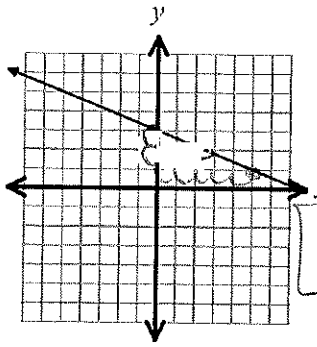


c) $y = \frac{1}{1}x - 5$ $m = \frac{1\uparrow}{1\rightarrow}$ or $\frac{\downarrow 1}{\leftarrow 1}$ ★ $b = -5$



Example 3: Write the equation, in slope-intercept form, of each line graphed below.

a)

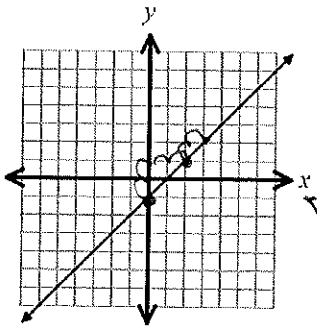


$m = \frac{\downarrow 2}{\rightarrow 5} = \frac{-2}{5}$

$b = 3$

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

b)



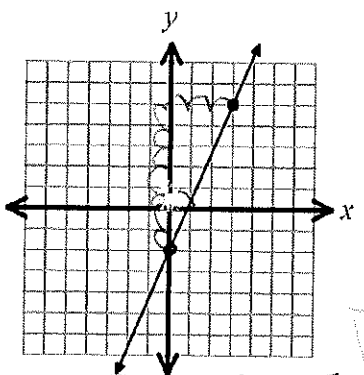
$m = \frac{1\uparrow}{1\rightarrow} = 1$

$b = -1$

$y = x - 1$

You try! Example 4: Write the equation, in slope-intercept form, of each line graphed below.

a)

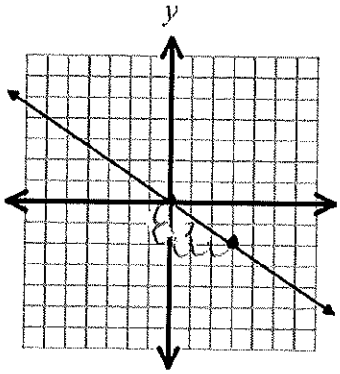


$m = \frac{7\uparrow}{3\rightarrow}$

$\frac{-2-5}{0-3} = \frac{-7}{-3} = \frac{7}{3}$

$y = \frac{7}{3}x - 2$

b)



$m = \frac{\downarrow 2}{\rightarrow 3} = \frac{-2}{3} =$

$b = 0$

$y = -\frac{2}{3}x + 0$

or

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

Connection: How can you tell by looking at the graph of a line if the slope should be positive or negative?

"ascending uphill" → positive slope

"descending downhill" → negative slope

The Slope Formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$$

Example 5a: Find the slope of the line that passes through the points $(-7, 2)$ and $(0, -4)$. (x_1, y_1 and x_2, y_2)

$$m = \frac{-4-2}{0-7} = \boxed{\frac{-6}{7}}$$

5b: Find the *y*-intercept of the line that passes through those same points.

$(0, y)$ look for point with input of 0.

$(0, -4)$ $b = -4$

5c: Write the equation, in slope-intercept form, of the line that passes through those points.

$$\boxed{y = -\frac{6}{7}x - 4}$$

Example 6: Write the equation, in slope-intercept form, of the line that passes through $(-3, 1)$ and $(-6, 2)$. (x_1, y_1 and x_2, y_2)

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

$y = mx + b$

$y = -\frac{1}{3}x + b$

$1 = -\frac{1}{3}(-3) + b$

$1 = 1 + b$

$0 = b$

$y = -\frac{1}{3}x + 0$

or

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

You try! Example 7: Write the equation, in slope-intercept form, of the line passing through *one* set of points listed below. Option A is the easiest choice, and Option C is the most challenging one. Choose the one that you are the most ready to attempt.

A) $(5, 3)$ and $(0, 11)$ (x_1, y_1 and x_2, y_2; b)

$m = \frac{11-3}{0-5} = \frac{8}{-5} = -\frac{8}{5}$

$b = 11$

$$\boxed{y = -\frac{8}{5}x + 11}$$

B) $(3.2, 7)$ and $(4.8, -9)$ (x_1, y_1 and x_2, y_2)

$m = \frac{-9-7}{4.8-3.2} = \frac{-16}{1.6} = -10$

$y = mx + b$

$y = -10x + b$

$7 = -10(3.2) + b$

$7 = -32 + b$

$39 = b$

$$\boxed{y = -10x + 39}$$

C) $(5, -2)$ and $(-6, -8)$ (x_1, y_1 and x_2, y_2)

$m = \frac{-8+2}{-6-5} = \frac{-6}{-11} = \frac{6}{11}$

$y = \frac{6}{11}x + b$

$-2 = \frac{6}{11}(5) + b$

$-2 = \frac{30}{11} + b$

$-\frac{22}{11} - \frac{30}{11} = -\frac{52}{11} = b$

$y = \frac{6}{11}x - \frac{52}{11}$

and identify slope & y-int

Example 7: Change the following equations into slope-intercept form. * isolate y!

a) $3x - y = 10$

$-3x \quad -3x$

$\frac{-y}{-1} = \frac{-3x}{-1} \quad \frac{+10}{-1}$

$y = 3x - 10$

$m = 3$

$b = -10$

b) $2x + 8y = -11$

$-2x \quad -2x$

$\frac{8y}{8} = \frac{-2x}{8} \quad \frac{-11}{8}$

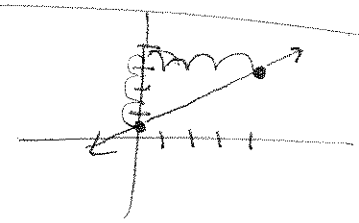
$y = \frac{1}{4}x - \frac{11}{8}$

$m = \frac{1}{4}$ $b = -\frac{11}{8}$

Ex 8: graph $y = \frac{3}{4}x + \frac{1}{2}$

$m = \frac{3\uparrow}{4\rightarrow}$

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



CONCEPT SUMMARY Slope-Intercept Form of a Linear Equation

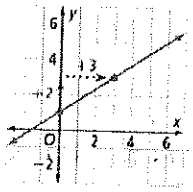
WORDS The slope-intercept form of a linear equation is used when the slope and the y-intercept of a line are known.

ALGEBRA The slope-intercept form of a line is $y = mx + b$.

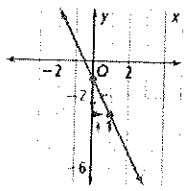
slope y-intercept

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

GRAPH



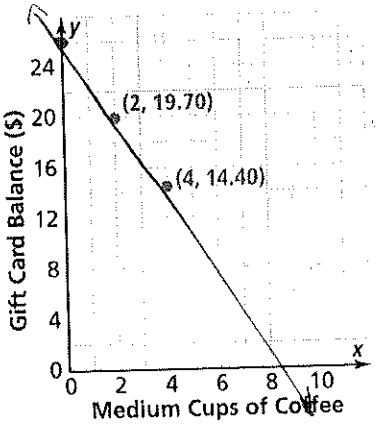
The line has a slope of $\frac{2}{3}$.
The y-intercept is 1.



The line has a slope of -2.
The y-intercept is -1.

2.2 Notes: (h, k) Form of a Line

Exploration #1: Allie received a gift card for her local coffee shop. Every time she goes to the shop, she gets a medium coffee. The graph shows her gift card balance after buying 2 coffees and 4 coffees.



Part A: Find the rate of change (slope) for the line that contains the two points shown. What does this represent in this problem?

$m = \frac{14.40 - 19.70}{4 - 2} = \frac{-5.3}{2} = -2.65$ SKIP

The cost of one cup of coffee.

Part B: Find the y-intercept for the line containing these points. What does that represent in this problem?

19.70
+ 2.65
22.35
+ 2.65 → 25

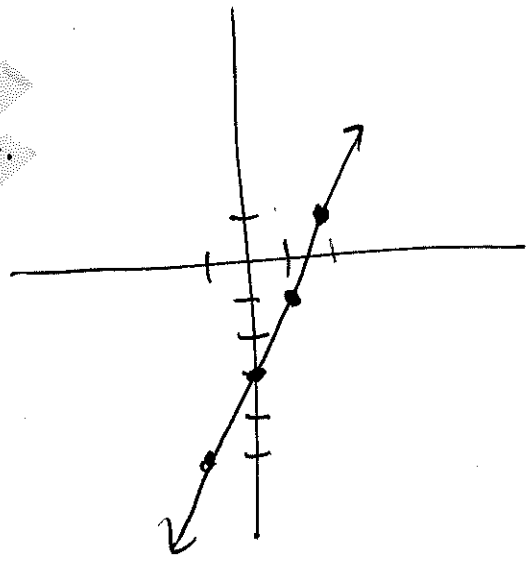
the starting amount on her gift card.

Part C: Use your results from Parts A and B to write the equation of the line that passes through these points.

$y = -2.65x + 25$

After definition of (h,k) on next page.

Consider $y = 2x - 3$. a) graph it!



b) name one or 2 pts on the line.

sample (0, -3)
(2, 1)

c) write in (h, k) form with one pt.

$y = 2(x - 0) - 3$

or

$y = 2(x - 2) + 1$

(h, k) Equation of a Line:

$$y = m(x-h)+k$$

m: slope; (h, k): any point on the line

* note: h has a sign change

Example 1a: Write the equation of the line, **in (h, k) form**, that passes through (5, -2) with a slope of -3. (h k)

$y = m(x-h)+k$

$y = -3(x-5)-2$

1b: Write the equation of the line from Example 1a in **slope-intercept form** of a line.

* distribute
* combine like terms

$y = -3(x-5)-2$

$y = -3x+15-2$

$y = -3x+13$

$y = -3x+13$

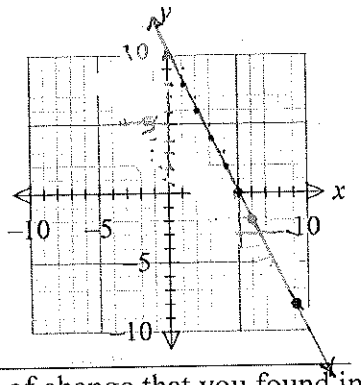
You try! Example 2: For each line described below, write the equation in (h, k) **form.** Then, write the equation in **slope-intercept form.**

a) through (-3, 1) with a slope of 2 (h k)

b) through (4, 6) with a slope of $\frac{3}{4}$. (h k)

	a) through (-3, 1) with a slope of 2	b) through (4, 6) with a slope of $\frac{3}{4}$.
(h, k) form	$y = 2(x+3)+1$	$y = \frac{3}{4}(x-4)+6$
slope-intercept form	$y = 2x+6+1$ $y = 2x+7$	$y = \frac{3}{4}x-3+6$ $y = \frac{3}{4}x+3$

Exploration #2. Consider the linear function that passes through the points (6, -2) and (9, -8).

Part A: Plot the two points, and draw the linear function that passes through them. 	Part B. Find the rate of change (or "slope") for this linear function. Either show mathematical work, or describe how you found your solution. $m = \frac{-8+2}{9-6} = \frac{-6}{3} = -\frac{2}{1}$
Part C. Use the rate of change that you found in Part B in order to find the y-intercept of the function. y-int = b = 10	Part D. Write the equation of the line in slope-intercept form. $y = -2x + 10$
Part E. Using the point (6, -2) and the slope you found in Part B, write the equation of the linear function in (h, k) form. $y = -2(x-6) - 2$	Part F. Using the point (9, -8) and the slope you found in Part B, write the equation of the linear function in (h, k) form. $y = -2(x-9) - 8$
Part G. Convert the linear function you wrote in Part E to slope intercept form. What do you notice when you compare your answer to Part D? $y = -2x + 12 - 2$ $y = -2x + 10$ Same line!	Part H. Convert the linear function you wrote in Part F to slope intercept form. What do you notice when you compare your answer to Part D? $y = -2x + 18 - 8$ $y = -2x + 10$ same line

Functional Notation: point $f(2) = 3 \rightarrow (2, 3)$ $f(-5) = 0 \rightarrow (-5, 0)$ $f(\text{input}) = \text{output}$

Example 3: Write the equation of the line, in (h, k) form, that contains $f(-11) = -2$ and has a slope of $\frac{m}{2}$.

$(-11, -2)$ h k

$y = 2(x+11) - 2$

You try! Example 4: Write the equation of the line, in (h, k) form, that contains $f(14) = -5$ and has a slope of $-\frac{1}{2}$.

$(14, -5)$ h k

$y = -\frac{1}{2}(x-14) - 5$

Using (h, k) form to write the equation of a line (in slope-intercept form) that passes through two points:

① use $m = \frac{y_2 - y_1}{x_2 - x_1}$ to find the slope.

② use one point as (h, k) → write in (h, k) form

③ distribute & combine like terms.

Example 5: Write the equation of the line that passes through $(5, -3)$ and $(1, -4)$. Write your final answer in slope-intercept form.

$h\ k$
$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{-4+3}{1-5} = \frac{-1}{-4} = \frac{1}{4}$$

$$y = \frac{1}{4}(x-5) - 3$$

$$y = \frac{1}{4}x - \frac{5}{4} - \frac{3\cdot 4}{1\cdot 4}$$

$$y = \frac{1}{4}x - \frac{5}{4} - \frac{12}{4}$$

$$\boxed{y = \frac{1}{4}x - \frac{17}{4}}$$

You Try! Example 6: Write the equation of the line, in slope-intercept form, that passes through the given points.

a) $(6, 2)$ and $(8, 10)$

$x_1\ y_1$ $x_2\ y_2$
$h\ K$

$$m = \frac{10-2}{8-6} = \frac{8}{2} = 4$$

$$y = 4(x-6) + 2$$

$$y = 4x - 24 + 2$$

$$\boxed{y = 4x - 22}$$

b) $f(-1) = 9$ and $f(-3) = 4$.

$h\ k$
$(-1, 9)$ $(-3, 4)$
$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{4-9}{-3+1} = \frac{-5}{-2} = \frac{5}{2}$$

$$y = \frac{5}{2}(x+1) + 9$$

$$y = \frac{5}{2}x + \frac{5}{2} + \frac{9\cdot 2}{1\cdot 2}$$

$$y = \frac{5}{2}x + \frac{5}{2} + \frac{18}{2}$$

$$\boxed{y = \frac{5}{2}x + \frac{23}{2}}$$

For Examples 7 – 9: The table shows the price that a customer pays for a certain amount of invitations ordered. Each price includes a price per invitation as well as a one-time set-up fee.

Choose any 2 points!

# of invitations x	Price (in dollars) $f(x)$
25	100
50	140
75	180
100	220

7) Write the equation of the line, in slope-intercept form, that represents the price based on the number of invitations purchased.

(25, 100) (50, 140)
x_1 y_1 x_2 y_2

$m = \frac{140-100}{50-25} = \frac{40}{25} = \frac{8}{5}$

$y = \frac{8}{5}(x-25)+100$

$y = \frac{8}{5}x - 40 + 100$

$y = \frac{8}{5}x + 60$

8) What is the price per invitation?

$\frac{8}{5}$ or $1.60 (slope)

$1.60

9) What is the cost of the one-time set-up fee?

y-int → $60

You Try! Example 10: Write the equation, in slope-intercept form, that represents the linear data shown in each table below.

a)

x	$f(x)$
15	100
20	115
25	130
30	145

(15, 100) (20, 115)
x_1 y_1 x_2 y_2

$m = \frac{115-100}{20-15} = \frac{15}{5} = 3$

$y = 3(x-15)+100$

$y = 3x - 45 + 100$

$y = 3x + 55$

b)

x	y
-4	-18
-2	-21
2	-27
4	-30

x_1 y_1 x_2 y_2
(2, -27) (4, -30)
h k

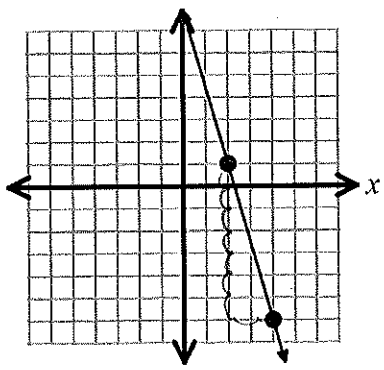
$m = \frac{-30+27}{4-2} = -\frac{3}{2}$

$y = -\frac{3}{2}(x-2)-27$

$y = -3x + 3 - 27$

$y = -3x - 24$

Example 11: Which of the following equations correctly model the linear function shown? Choose all that apply.



A) $y = -\frac{7}{2}(x+2)+1$
B) ~~$y = \frac{7}{2}(x-1)+2$~~
C) $y = -\frac{7}{2}(x-4)-6$
D) ~~$y = \frac{7}{2}(x+6)-4$~~
E) $y = -\frac{7}{2}(x-2)+1$
F) $y = -\frac{7}{2}x+8$

$m = -\frac{7}{2}$ (2, 1) (4, 6)
h k

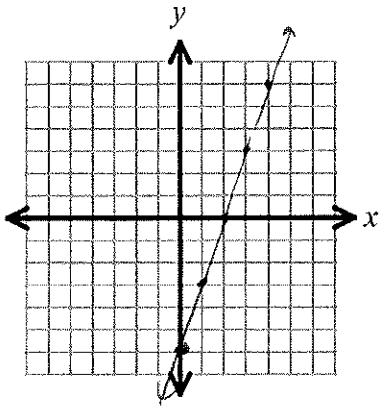
$y = -\frac{7}{2}(x-2)+1$

$y = -\frac{7}{2}x + 7 + 1$

2.3 Notes: Standard Form

Warm-up: **For #1 – 3, use $y = 3x - 6$.**

1) Graph the line.



2) What is the y-intercept of the line?

$(0, -6)$

3) At what x-value does the line cross the x-axis?

$(2, 0)$

Key Vocabulary

Standard Form of a Line $Ax + By = C$

(A, B, C are integers... A is positive)

***x*-intercepts** * the value of x when $y = 0$.

$(x, 0)$

***y*-intercepts** * the value of y when $x = 0$.

$(0, y)$

Example 1: Find the x- and y-intercepts of the graph of each equation:

a) $4x + 3y = 24$

x-int: $4x + 3(0) = 24$, $4x = 24$, $x = 6$, $(6,0)$

y-int: $4(0) + 3y = 24$, $3y = 24$, $y = 8$, $(0,8)$

b) $x - 2y = -70$

x-int: $x - 2(0) = -70$, $x = -70$, $(-70,0)$

y-int: $(0) - 2y = -70$, $-2y = -70$, $y = 35$, $(0,35)$

You Try! Example 2: Find the x- and y-intercepts of the graph of each equation:

a) $-5x + 3y = 15$

x-int: $-5x = 15$, $x = -3$, $(-3,0)$

y-int: $3y = 15$, $y = 5$, $(0,5)$

b) $8x - 4y = 16$

x-int: $8x = 16$, $x = 2$, $(2,0)$

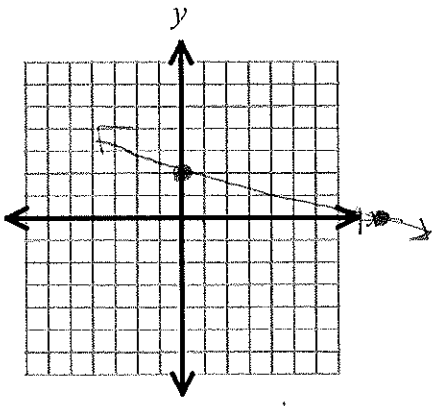
y-int: $-4y = 16$, $y = -4$, $(0,-4)$

Example 3: Graph each line by using x- and y-intercepts.

a) $x + 4y = 8$

x-int: $x = 8$, $(8,0)$

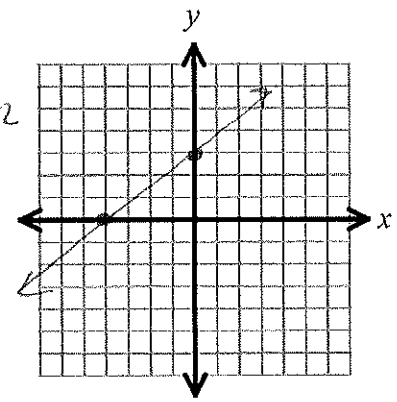
y-int: $4y = 8$, $y = 2$, $(0,2)$



b) $3x - 4y = -12$

x-int: $3x = -12$, $x = -4$

y-int: $-4y = -12$, $y = 3$



Note: try 3a) again by converting to slope-intercept form. Is the graph the same?

$\frac{4y}{4} = \frac{-x}{4} + \frac{8}{4}$

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

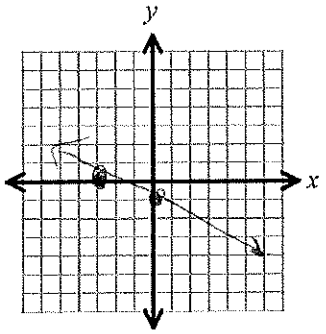
Same line!

You try for parts c) and d)!

c) $-10x - 30y = 30$

x-int: $-10x = 30$, $x = -3$

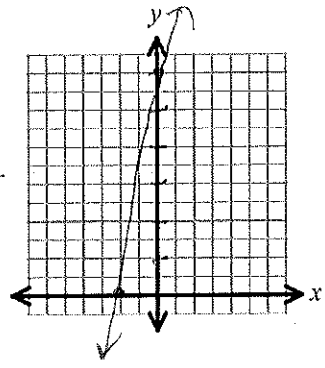
y-int: $-30y = 30$, $y = -1$



d) $6x - y = -12$

x-int: $6x = -12$, $x = -2$

y-int: $-y = -12$, $y = 12$



Equations of Special Lines:

Horizontal Line: $y = \#$

(slope = 0)

Vertical Line: $x = \#$

(slope = undefined)

Example 4: Write the equation of each special line described.

a) The horizontal line passing through (-3, 2). (x, y) $y = 2$

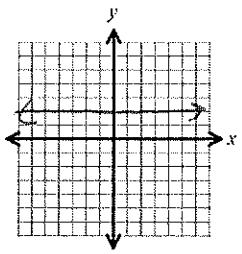
b) The vertical line passing through (-3, 2). $x = -3$

c) The vertical line passing through (5, -10). $x = 5$

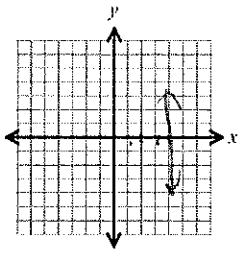
d) The horizontal line passing through (5, -10). $y = -10$

Example 5: Sketch the graph of each equation. Notice that each is a special line.

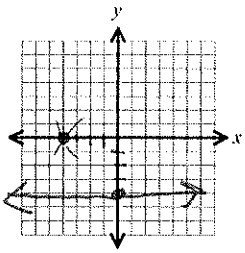
a) $y = 2$ horiz.



b) $-3x = -12$ $x = 4$ vertical

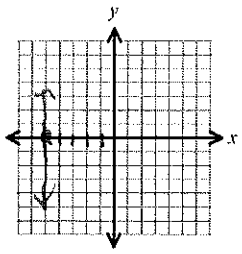


c) $-y = 4$ $y = -4$ horizontal

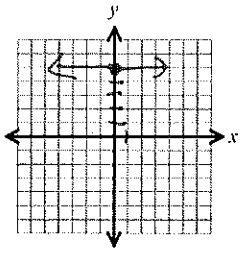


You try!

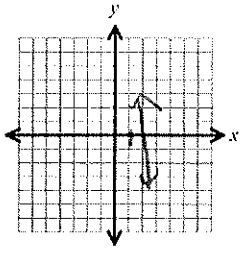
c) $x = -5$ vertical



d) $-3y = -15$ $y = 5$ horizontal



e) $7x = 14$ $x = 2$ vertical



Writing the equation of a line in Standard Form:

$Ax + By = C$ where A, B, and C are integers and A is positive.

BONUS!

* move Ax and By terms to left side (sign change)
* move the constant C term to the right side (sign change)
* Fraction? multiply all terms by denom to clear out fraction
* Is A negative? multiply all terms by -1.

Example 6: Write each line in standard form. $Ax + By = C$ where $A, B,$ and C are integers and A is positive.

a) $y = 2x + 5$

$-2x + y = 5$

$2x - y = -5$

b) $y = -\frac{5}{3}x + 6$

$3\left(\frac{5}{3}x + y = 6\right)$

$5x + 3y = 18$

BONUS

You try for parts c) and d)!

c) $y = -7x - 19$

$7x + y = -19$

d) $y = 4x - \frac{1}{8}$

$8\left(-4x + y = -\frac{1}{8}\right)$

$-32x + 8y = -1$

$32x - 8y = 1$

Example 7: Paxton runs a summer camp, and he has budgeted \$300 to spend on shirts and hats. The shirts cost \$20.00 each, and the hats cost \$12.00 each.

a) Write an equation that can model the situation if he buys x shirts and y hats.

$20x + 12y = 300$

b) How many hats can he get if he only buys hats?

0 shirts → find y-int

$12y = 300$

$y = 25$ hats

d) How many shirts can he buy if he only purchases shirts?

0 hats → find x-int

$20x = 300$

$x = 15$ shirts

2.4 Notes: Parallel and Perpendicular Lines

Warm-up:

1) Find the slope between the two points: (-3, -11) and (7, 5)

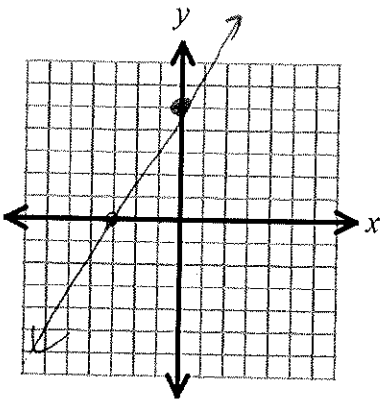
$m = \frac{5+11}{7+3} = \frac{16}{10} = \frac{8}{5}$

2) Graph the line: $5x - 3y = -15$

x-int

$5x = -15$ $-3y = -15$

$x = -3$ $y = 5$



Parallel Lines (//)

* same slope
* diff y-int
* // lines never intersect

Perpendicular Lines ($\perp$)

* lines intersect at a right angle
* slopes are opposite reciprocals. (+, −)

Example 1: For each line, identify its slope. Then find the slope of a line parallel to that line, and the slope of a line perpendicular to the given line.

Lines	Slope	Parallel Slope	Perpendicular Slope
$y = -3x + 5$	-3	-3	$\frac{1}{3}$
$y = \frac{2}{9}x - 1$	$\frac{2}{9}$	$\frac{2}{9}$	$-\frac{9}{2}$
$y = x - 11$	1	1	-1
$3x - 5y = 7$ $-5y = -3x + 7$ $y = \frac{3}{5}x - \frac{7}{5}$	$\frac{3}{5}$	$\frac{3}{5}$	$-\frac{5}{3}$
$2x + 6y = 14$ $6y = -2x + 14$ $y = -\frac{1}{3}x + \frac{8}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$	3
$x = -3$	und	und	0
$y = 7$	0	0	und

(∥) (⊥)

Examples 2 – 6: Are the graphs of each pair of lines parallel, perpendicular, or neither?

2) $y = 3x + 6$; $2y = -6x - 18$

$y = -3x - 18$

neither

3) $x = -3; x = -2$

any 2 vertical lines are ∥

∥

4) $5x - 2y = 7$; $y = -\frac{2}{5}x + 3$

$-2y = -5x + 7$

$y = \frac{5}{2}x - \frac{7}{2}$

⊥

You try for #5 – 6!

5) $y = 4x - 9$; $4y = 16x + 7$

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

∥

6) $x = -18; y = 24$

any vert line is ⊥ to any horizontal line

⊥

Writing Equations of Parallel and Perpendicular Lines

Parallel	Perpendicular
* use same slope	* use opp reciprocal slope
* start in (h, k) form	* start in (h, k) form
* distribute & combine like terms	* distribute & combine like terms

Examples 7 – 10: Write the equation of the line that passes through the given point and is parallel to the given line. Write your answer in slope-intercept form.

7) $(-4, 9); y = -\frac{3}{4}x + 1$

h k m

$y = -\frac{3}{4}(x + 4) + 9$

$y = -\frac{3}{4}x - 3 + 9$

$y = -\frac{3}{4}x + 6$

8) $(5, -2); 3x - y = 12$

h k

$-y = -3x + 12$

$y = 3x - 12$

m

$y = 3(x - 5) - 2$

$y = 3x - 15 - 2$

9) $(-2, 8); y = 15$

horizontal

$y = 8$

10) $(17, 5); x = -1$

$y = 3x - 17$

vertical

$x = 17$

You Try! Examples 11 – 12: Write the equation of the line that passes through the given point and is parallel to the given line. Write your answer in (h, k) form.

11) $(-6, 1); 2x + 3y = 4$

h k

$3y = -2x + 4$

$y = -\frac{2}{3} + \frac{4}{3}$

m

$y = -\frac{2}{3}(x + 6) + 1$

12) $(-41, 2); x = 15$

$x = -41$

Examples 13 – 16: Write the equation of the line that passes through the given point and is perpendicular to the given line. Write your answer in slope-intercept form.

13) $(4,7); y = -2x + 5$

h k

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

$y = \frac{1}{2}(x-4) + 7$

$y = \frac{1}{2}x - 2 + 7$

$y = \frac{1}{2}x + 5$

14) $(21,-9); 3x - 7y = 10$

h k

$-7y = -3x + 10$

$y = \left(\frac{3}{7}\right)x - \frac{10}{7}$

$\perp m = -\frac{7}{3}$

$y = -\frac{7}{3}(x-21) - 9.$

$y = -\frac{7}{3}x + 49 - 9$

$y = -\frac{7}{3}x + 40$

15) $(-7,-2); y = 1$

$\perp$ would be vertical line

$x = -7$

16) $(-25,8); x = 0$

$\perp$ would be horizontal line

$y = 8$