NB *Foundations and Pre-Calculus Math 10* *Name:* Notes Key

Chapter 6 Notes

STUDENT COPY **Final Mark: /8**

Marks → Requirement ↓	**2**	**1**	**0**
Notes Present	All notes present	Most notes present	Less than half of notes present
Organization / Neatness	Notes in chronological order, name and date on everything	Almost all notes in chronological order, name and date on most pages	Mostly out of order, name and date often missing
Questions	Question column completed on all notes, higher level questions attempted	Most question columns complete, some higher level questions	Less than half of the question columns complete
Main Ideas and Reflections	All 'main ideas' and 'reflections' complete with care in notes	Most 'main ideas' and 'reflections' complete in notes	Less than half of the 'main ideas' and 'reflections' complete

*If your mark does not total up to at least 4 out of 8, your notes are INCOMPLETE and must be fixed up as soon as possible and re-evaluated.

TEACHER COPY **Final Mark: /8**

Marks → Requirement ↓	**2**	**1**	**0**
Notes Present	All notes present	Most notes present	Less than half of notes present
Organization / Neatness	Notes in chronological order, name and date on everything	Almost all notes in chronological order, name and date on most pages	Mostly out of order, name and date often missing
Questions	Question column completed on all notes, higher level questions attempted	Most question columns complete, some higher level questions	Less than half of the question columns complete
Main Ideas and Reflections	All 'main ideas' and 'reflections' complete with care in notes	Most 'main ideas' and 'reflections' complete in notes	Less than half of the 'main ideas' and 'reflections' complete

6.1 – Slope of a Line

Name: KEY
Date:

Goal: Determine the slope of a line segment and a line.

Toolkit:
- Rate of change
- Simplifying fractions

Main Ideas:

Definitions

Rise: the vertical distance between two points.

Run: the horizontal distance between two points.

Slope: a measure of how one quantity changes with respect to the other, it can be calculated using:

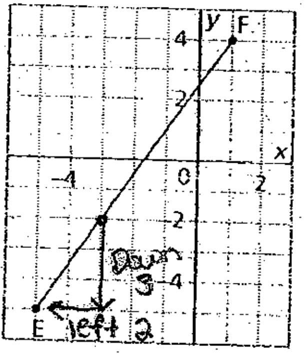
$$\text{Slope: } \frac{rise}{run} = \frac{\textit{change in dependent variable}}{\textit{change in independent variable}}$$

Determining the Slope of a Line Segment

Ex 1) Determine the slopes of the following line segments.

Step 1: Choose two points on the line segment.
Step 2: Count the units to determine the *rise* and the *run*.
Step 3: Write the fraction in simplest form.

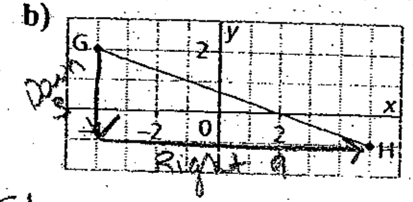
a)



Slope = $\frac{rise}{run} = \frac{down\ 3}{left\ 2} = \frac{-3}{-2} = \boxed{\frac{3}{2}}$

Line segment EF has slope $\frac{3}{2}$.

b)



Slope = $\frac{rise}{run} = \frac{down\ 3}{right\ 9} = \frac{-3}{9} = \boxed{\frac{-1}{3}}$

Line segment GH has slope $-\frac{1}{3}$.

When a line segment goes up to the right, both x and y increase. Both the rise and run are positive, so the slope of the line segment is positive.

When a line segment goes down to the right, y decreases and x increases. The rise is negative and the run is positive, so the slope of the line segment is negative.

For a horizontal line segment, the change in y is 0. The rise is 0 and the run is positive.

$$\text{Slope} = \frac{rise}{run} = \frac{0}{run} = 0$$

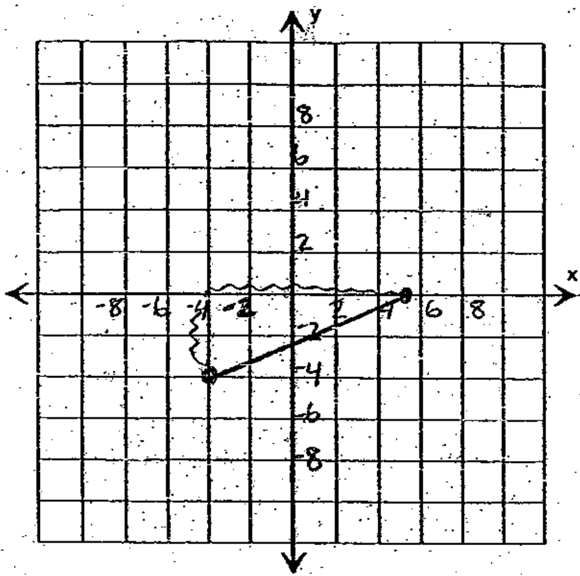
For a vertical line segment, y increases and the change in x is 0. The rise is positive and the run is 0.

$$\text{Slope} = \frac{rise}{run} = \frac{rise}{0} = \text{undefined}$$

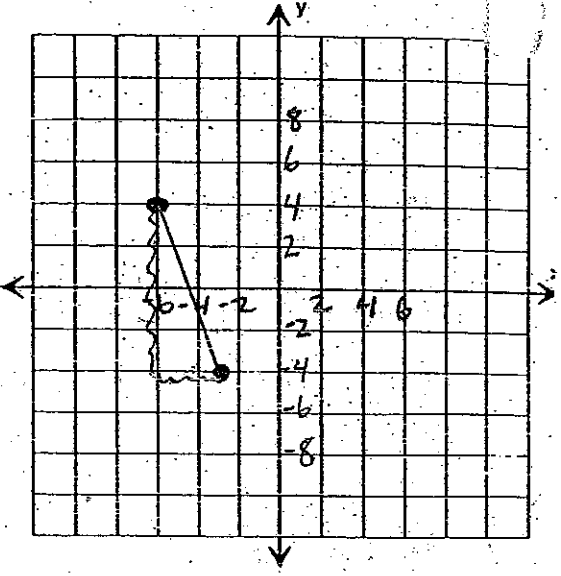
Drawing a line segment with a given slope.

Ex 2) Draw a line segment with the given slope.

a) slope = $\frac{4}{9}$ $\begin{array}{l}\rightarrow \text{rise}\\ \hline \rightarrow \text{run}\end{array}$



b) slope = $\frac{-8}{3}$ $\begin{array}{l}\rightarrow \text{rise}\\ \hline \rightarrow \text{run}\end{array}$



Finding slope when given two points.

Ex 3) Determine the slope of the line that passes through E(4,-5) and F(8,6).

Slope of a line = $\frac{y_2-y_1}{x_2-x_1}$ $A(x_1,y_1)$ $B(x_2,y_2)$

$E(\overset{x_1}{4},\overset{y_1}{-5})$ $F(\overset{x_2}{8},\overset{y_2}{6})$

$\text{Slope} = \frac{y_2-y_1}{x_2-x_1}$ * substitute the x and y values into the formula

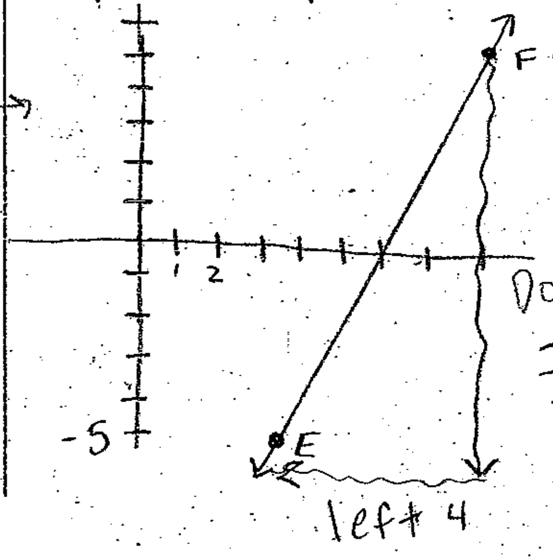
$= \frac{6-(-5)}{8-4} = \frac{6+5}{8-4} = \frac{11}{4}$

The slope of EF is $\boxed{\frac{11}{4}}$

How else could we have found the slope?

- plot the points and graph the line

use sticky? →



$\frac{-11}{-4} = \boxed{\frac{11}{4}}$

Interpreting the slope of a line

Ex 4)

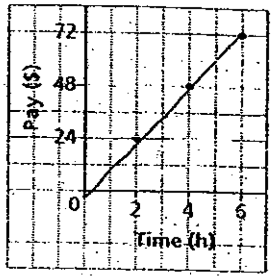
Tom has a part-time job. He recorded the hours he worked and his pay for 3 different days. Tom plotted these data on a grid.

a) What is the slope of the line through these points?
b . What does the slope represent?
c) How can the answer to part b be used to determine:

i) how much Tom earned in $3\frac{1}{2}$ hours?

ii) the time it took Tom to earn $30?

Graph of Tom's Pay



a) Slope = $\frac{\text{rise}}{\text{run}} = \frac{\$24}{2hr} = 12$

The slope of the line is 12.

b) The units are \$ per h, so the slope represents his rate of pay = \$12/h.

c) We know Tom makes \$12/h so:

i) $\$12 \times 3\frac{1}{2}h = \$42$

Tom earned \$42 in $3\frac{1}{2}$hr.

ii) \$12 for 1hr so $\frac{\$30}{\$12} = \frac{t}{1hr}$

$t = 2.5$ or $2\frac{1}{2}$hr.

It took Tom $2\frac{1}{2}$hr to make \$30.

*Look on the graph to see if your answers to "C" make sense.

Reflection: How is the slope of a line related to rate of change?

6.2 – Slopes of Parallel and Perpendicular Lines

Name: Key
Date:

Goal: to use slope to determine whether two lines are parallel or perpendicular.

Toolkit:

- Slope
- Simplifying fractions
- Reciprocals

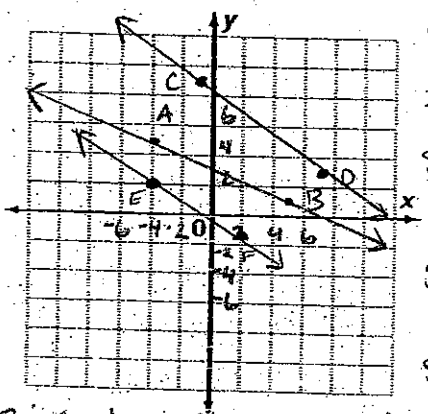
Main Ideas:

Identifying Parallel Lines

Lines that have the same slope **are parallel.**

Ex 1) Line EF passes through E(-4,2) and F(2,-1).
Line CD passes through C(-1,7) and D(7,3).
Line AB passes through A(-4,5) and B(5,1).
Sketch the lines. Are they parallel?

Recall: $\text{Slope} = \dfrac{y_2 - y_1}{x_2 - x_1}$



EF and CD look like they could be parallel, but calculate the slope to be sure.

$\text{Slope } EF = \dfrac{-1-2}{2-(-4)} = \dfrac{-3}{6} = \boxed{-\dfrac{1}{2}}$ ✓

$\text{Slope } CD = \dfrac{3-7}{7-(-1)} = -\dfrac{4}{8} = \boxed{-\dfrac{1}{2}}$ ✓

$\text{Slope } AB = \dfrac{1-5}{5-(-4)} = \boxed{-\dfrac{4}{9}}$

EF & CD have the same slope so they are parallel.

Identifying perpendicular lines

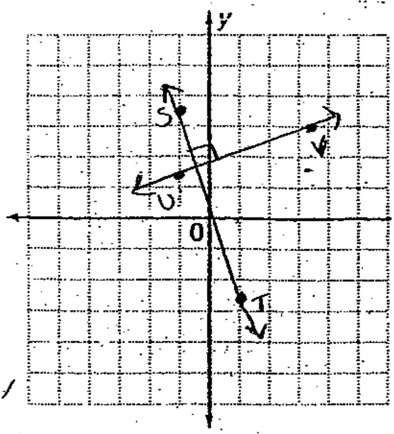
The slopes of two perpendicular lines are negative reciprocals**; that is a line with a slope $a, a \neq 0$, is perpendicular to a line with slope $-\frac{1}{a}$**

Ex 2) Line ST passes through S(-2,7) (x_1, y_1) and T(2,-5) (x_2, y_2). Line UV passes through U(-2,3) (x_1, y_1) and V(7,6) (x_2, y_2).

Are these lines parallel, perpendicular or neither? Calculate the slopes, and then sketch the lines to verify your answer.

$\text{Slope } ST = \dfrac{-5-(-7)}{2-(-2)} = \dfrac{-12}{4} = -3 = \dfrac{-3}{1}$

$\text{Slope } UV = \dfrac{6-3}{7-(-2)} = \dfrac{3}{9} = \dfrac{1}{3}$



$\dfrac{-3}{1}$ and $+\dfrac{1}{3}$ are negative reciprocals, so ST and UV are perpendicular lines.

Perpendicular = two lines that form a 90° angle.

Identifying a line perpendicular to a given line.

Ex 3)

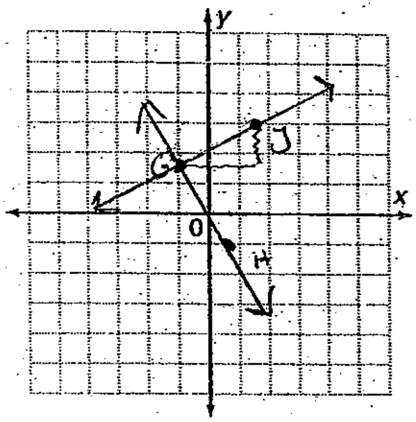
a) Determine the slope of a line that is perpendicular to the line through G(-2,3) and H(1,-2).

1st find the slope of GH.

Slope GH = $\frac{-2-3}{1-(-2)} = \frac{-5}{3}$ → The slope of a line perpendicular (⊥) to $-\frac{5}{3}$ is the negative reciprocal $\boxed{\frac{3}{5}}$

b) Determine the coordinates of J so that line GJ is perpendicular to line GH.

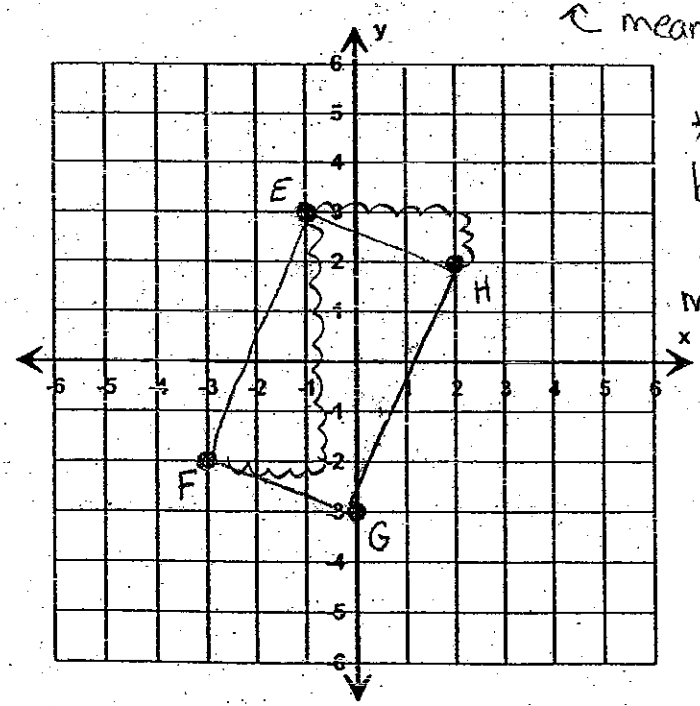
Slope of GJ is $\frac{3 \rightarrow \text{rise}}{5 \rightarrow \text{run}}$



Using slope to identify a polygon.

Ex 4) EFGH is a parallelogram. Is it a rectangle?

↑ means that each ∠ is 90°



* So lines have be perpendicular to each other which means that the slopes of EH and EF should be negative reciprocals

Slope EH = $\frac{\text{rise}}{\text{run}} = -\frac{1}{3}$

Slope EF = $\frac{\text{rise}}{\text{run}} = 5/2$

These are not negative reciprocals, so the lines are not perpendicular, so not a rectangle

Reflection: What have you learned about parallel and perpendicular lines?

6.4 – Slope-Intercept Form of the Equation for a Linear Function

Name: Key
Date:

Goal: to relate the graph of a linear function to its equation in slope-intercept form.

Toolkit:

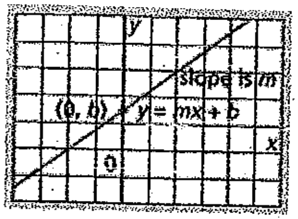
- Slope of a line $(m) = \frac{y_2-y_1}{x_2-x_1} \rightarrow \frac{rise}{run}$
- The y-intercept (vertical intercept) of a line is b

Main Ideas:

What is Slope-Intercept Form of the Equation of a Linear Function

The equation of a linear function can be written in the form $y=mx+b$, where m is the slope of the line and b is its y-intercept (with coordinates $(0,b)$).

$$y = \underset{\text{slope}}{\underset{\uparrow}{m}}x + \underbrace{b}_{\text{y-intercept}}$$



Writing an Equation Given Slope and y-intercept

Ex. 1) The graph of a linear function has a slope $\frac{3}{5}$ and y-intercept of -4. Write an equation for this function.

$y = mx + b$ (Substitute $m = \frac{3}{5}, b = -4$)

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

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

Graphing a Linear Function Given the Equation in $y = mx + b$

Ex. 2) Graph the linear functions with the following equations:

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

$y = mx + b$

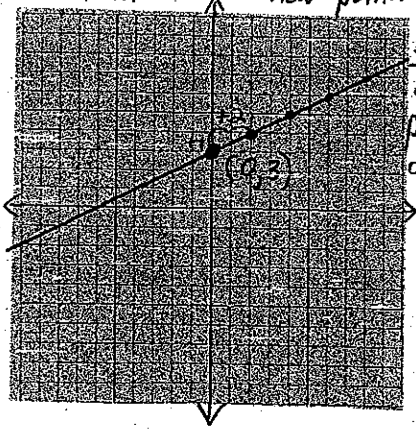
so: $m = \frac{1}{2}$ (slope)

$b = +3$ (y-int)

step 1: plot y-int = +3
so, plot point $(0,3)$

step 2: slope of line $= \frac{1}{2} = \frac{rise}{run}$

so, from $(0,3)$ move "up 1, right 2", then mark a new point.



step3: draw line through points w/ruler all the way across graph.

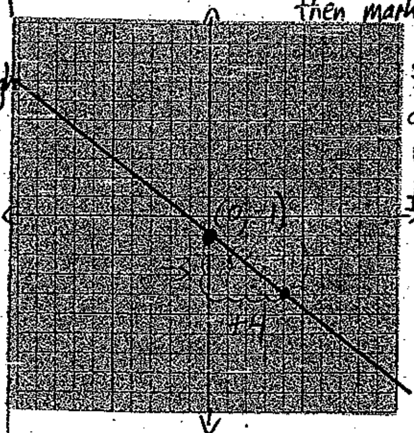
b) $y = -\frac{3}{4}x - 1$

$y = mx + b$ $m = -\frac{3}{4}$ $b = -1$

step 1: plot y-int -1
so, plot point $(0,-1)$

step 2: slope $= -\frac{3}{4}$ (hint: put neg. on top #!)

$= \frac{-3}{4}$ so, from $(0,-1)$, "rise" -3 (drop 3), and "run" $+4$ (right 4), then mark new point

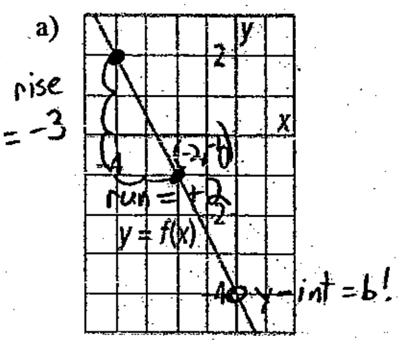


step 3: draw line w/ruler through points.

Writing the Equation of a Linear Function Given Its Graph

Ex. 3) Write equations to describe the following functions. Verify the equation.

a)



$y = mx + b \rightarrow$ need m and b!

step 1: b (y-int) = -4 (0, -4)

step 2: $m = \frac{rise}{run} = \frac{-3}{2}$

step 3: sub these in for m and b

$\boxed{y = -\frac{3}{2}x - 4}$

verify: - choose a pt. on the line ex. (-2,-1)
- substitute these coordinates into equation.

$\boxed{\text{since } LS = RS}$, the equation is correct!

verify

(x, y)

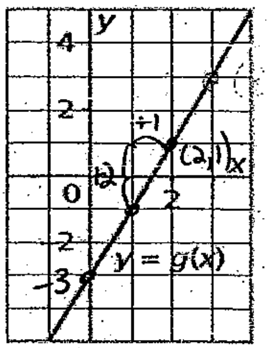
pt. (-2,-1)

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

LS	RS
y	$-\frac{3}{2}x - 4$
-1	$-\frac{3}{2}(-2) - 4$
	$\frac{6}{2} - 4$
	3 - 4
	-1

LS = RS ✓

b)



b = -3 $m = \frac{+2}{+1}$ m = 2

so, y = mx + b

so, $\boxed{y = 2x - 3}$

(x, y)

verify choose pt. on line... (2,1)

y = 2x - 3

LS	RS
y	2x - 3
1	2(2) - 3
	4 - 3
	1

$\boxed{LS = RS}$ ✓ the equation is correct

Using an Equation of a Linear Function to Solve a Problem

Ex. 4) The student council sponsored a dance. A ticket cost $5 and the cost for the DJ was $300.   P = profit   t = tickets

a) Write an equation for the profit, *P*, on the sale of *t* tickets.

Profit = Income - Expenses   Income = 5t   Expenses = $300

so, P = 5t - 300

b) Suppose 123 people bought tickets. Find the profit.

so, t = 123   sub t = 123 into equation, find P.

P = 5t - 300

P = 5(123) - 300

P = 615 - 300

P = 315

∴ profit was $315

c) Suppose the profit was $350. How many people bought tickets?

P = 5t - 300   sub. P = 350, find t:

$350^{+300} = 5t - 300^{+300}$

$\frac{650}{5} = \frac{5t}{5}$

t = 130   ∴ 130 people bought tickets.

d) Could the profit be exactly $146? Justify the answer.

P = 5t - 300   sub in P = 146, find t

$146^{+300} = 5t - 300^{+300}$

$\frac{446}{5} = \frac{5t}{5}$

t = 89.2   but, you must have a WHOLE # of tix, so P can't be $146!

Reflection: How do the values of *m* and *b* in the linear equation *y*=*mx*+*b* relate to the graph of the corresponding linear function? Use examples to help.

6.5 – Slope-Point Form of the Equation for a Linear Function

Name: Key
Date:

Goal: to relate the graph of a linear function to its equation in point-slope form

Toolkit:

- $y = mx + b$
- m is the slope of the line
- b is the y-intercept (vertical intercept) of a line

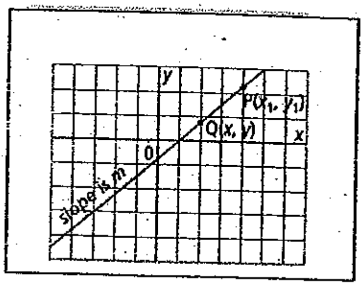
Main Ideas:

What is Slope-Point Form of the Equation of a Linear Function

The equation of a line that passes through $P(x_1, y_1)$ and has slope m is:

slope of line

$$\underbrace{y - y_1}_{\text{y coordinate of known point}} = \overset{\downarrow}{m}(x - \underbrace{x_1}_{\text{x coordinate of known point}})$$



**Notice: this is just the *slope formula* rearranged → $\frac{y-y_1}{x-x_1} = m$ (slope)

$$\rightarrow \frac{y-y_1}{\cancel{(x-x_1)}}\cancel{(x-x_1)} = m(x - x_1)$$

$$\rightarrow \boxed{y - y_1 = m(x - x_1)}$$ slope-point form.

Graphing a Linear Function Given Its Equation in Slope-Point Form

Ex. 1) a) Identify the slope of the line and the coordinates of a point on the line with this equation:

$$\overset{y}{y} - \overset{y_1}{2} = \frac{1}{3}(x + 4)$$

slope = $\boxed{m = \frac{1}{3}}$

slope-pt form: $y - y_1 = m(x - x_1)$

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

rewrite, using subtraction for operations! $y - \underset{y_1=2}{2} = \frac{1}{3}(x - \underset{x_1=-4}{(-4)})$

coordinates (x_1, y_1)

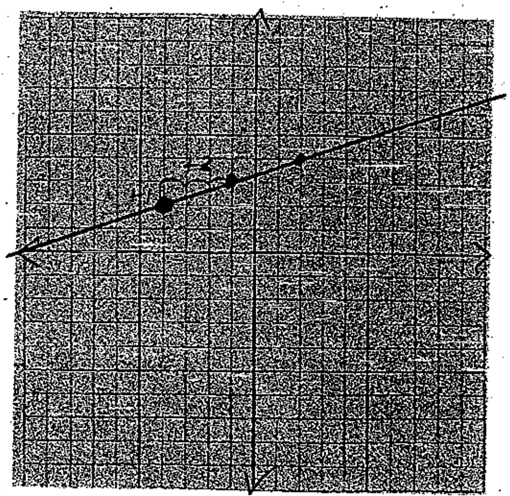
*from equation: $x_1 = -4$, $y_1 = 2$

point is $\boxed{(-4, 2)}$

b) Graph this equation:

step 1: start with a point on the line.
we know $(-4, 2)$ is on the line
so plot $(-4, 2)$.

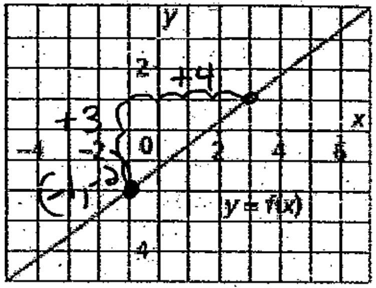
step 2: use slope of $\frac{1}{3}$ to find another point.
start at $(-4, 2)$.
slope $= \frac{1}{3}$, so up 1, right 3.
place new point, connect w/ruler.



Writing an Equation Using a Point on the Line and Its Slope

$(-1,-2)$
x_1, y_1

Ex. 2) a) Write an equation in slope-point form for this line



Need: 1 point on the line, slope of line.

* point on line is $(-1,-2)$

* slope $(m) = \frac{\text{rise}}{\text{run}} = \frac{+3}{+4} = \frac{3}{4}$

sub these into slope-point form

$$y - y_1 = m(x - x_1)$$
$$y - (-2) = \frac{3}{4}(x - (-1))$$
$$\boxed{y + 2 = \frac{3}{4}(x+1)}$$

b) Write the equation in part a in slope-intercept form. What is the y-intercept of this line?

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

$$y + 2 \overset{-2}{=} \frac{3}{4}x + \frac{3}{4}^{-2}$$ solve for y

$$y = \frac{3}{4}x + \frac{3}{4} - 2$$ get common denominator

$$y = \frac{3}{4}x + \frac{3}{4} - \frac{8}{4}$$

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

y-intercept is $\frac{-5}{4}$

Writing an Equation of a Linear Function Given Two Points

Ex. 3) a) Write an equation for the line that passes through the points G(−3, −7) and H(1, 5)

to write an equation in slope-point form, we need:

① the slope, and ② a point. We have a point... $(-3,-7)$ or $(1,5)$

so... Find slope using slope formula, between the given points.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \underset{x_1\ y_1}{(-3,-7)}\underset{x_2\ y_2}{(1,5)}$$

$$m = \frac{5-(-7)}{1-(-3)}$$

$$m = \frac{5+7}{1+3} = \frac{12}{4} = 3!$$

→ now, with $m = 3$, and point $\overset{x,y_1}{(1,5)}$ ↗ or $(-3,-7)$
write eqn. in slope-point form.

$$y - y_1 = m(x - x_1)$$
$$\boxed{y - 5 = 3(x-1)}$$

see left column for slope-intercept form

as slope-point

$$y - 5 = 3(x-1)$$

or... as slope-intercept

$$y - 5 = 3(x-1)$$
$$y - 5 \overset{+5}{=} 3x - 3^{+5}$$
$$\boxed{y = 3x + 2}$$

b) Write an equation for the line that passes through the points J(−3, 3) and K(5, −1)

We have a point... either $(-3,3)$ or $(5,-1)$

so we just need slope!

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \underset{x_1 y_1}{(-3,3)}\underset{x_2\ y_2}{(5,-1)}$$

$$m = \frac{-1-3}{5-(-3)}$$

$$m = \frac{-4}{8} = \boxed{\overset{m=}{-\frac{1}{2}}}$$

→ now, with $m = -\frac{1}{2}$ and point $\overset{x,y_1}{(-3,3)}$ or $(5,-1)$!

$$y - y_1 = m(x - x_1)$$
$$y - 3 = -\frac{1}{2}(x - (-3))$$
$$\boxed{y - 3 = -\frac{1}{2}(x+3)}$$

see left column for slope-intercept form

as slope-point

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

or... as slope-intercept

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

Reflection: Explain how the general expression for the slope of a line can help you remember the equation $y - y_1 = m(x - x_1)$

6.6 – General Form of the Equation for a Linear Relation

Name: Key
Date:

Goal: to relate the graph of a linear function to its equation in general form.

Toolkit:
- Slope-Intercept form→ $y = mx + b$
- Slope-Point form→ $y - y_1 = m(x - x_1)$
- Rearranging Equations

Main Ideas:

What is General Form of the Equation of a Linear Relation?

How is Standard Form similar?

GENERAL FORM of the Equation of a Linear Relation:

$$Ax + By + C = 0$$

where A is a whole number (not negative!), and B and C are integers.

STANDARD FORM of the Equation of a Linear Relation:

$$Ax + By = C$$

Rewriting an Equation in General Form

Ex. 1) Write each equation in general form and standard form:

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

multiply EVERY term by 3. (L.C.D.)

$(y)^3 = \left(-\frac{2}{\cancel{3}}x\right)^{\cancel{3}} + (4)^3$

$\overset{+2x\ -12}{3y} = \overset{+2x}{-2x} + \overset{-12}{12}$

move all terms to left side ↳ (so x term is pos.)

General $\boxed{2x+3y-12=0}$

Standard $\boxed{2x+3y=12}$

move constant to other side of = sign

b) $y - 1 = \frac{3}{5}(x+2)$ one term!

multiply EVERY term by 5 (LCD)

$(y)^5 - (1)^5 = \left(\frac{3}{\cancel{5}}(x+2)\right)^{\cancel{5}}$

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

expand brackets

$\overset{-5y}{5y} - \overset{+5}{5} = 3x \overset{-5y}{+} 6^{+5}$

$0 = 3x - 5y + 11$

move all terms right→(so x term pos.)

$\boxed{3x-5y+11=0}$ General

$\boxed{3x-5y=-11}$ Standard

Graphing a Line in General Form

Ex. 2) a) Determine the x- and y-intercepts of the line whose equation is $3x + 2y - 18 = 0$

change to standard form:

$\boxed{3x+2y=18}$

x-int: set y=0 (or cover y term!), solve for x.

$3x+2y=18$
$3x+2(0)=18$
$3x=18$
$x=6$

$\boxed{x\text{-int}=6 \text{ or } (6,0)}$

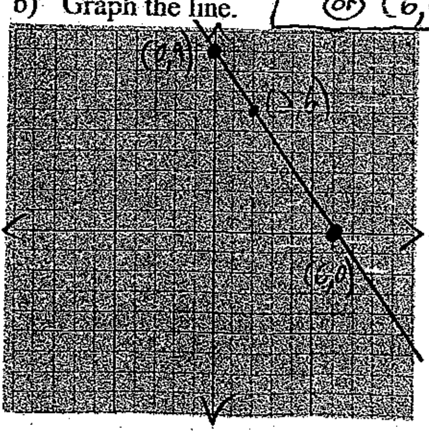
y-int: set x=0 (or cover x term), solve for y

$3x+2y=18$
$3(0)+2y=18$
$2y=18$
$y=9$

$\boxed{y\text{-int}=9 \text{ or } (0,9)}$

b) Graph the line.

- plot intercepts
- connect w/ruler



c) Verify that the graph is correct

choose pt. on graph... (2, 6)

sub (2, 6) into equation

LS	RS
$3x+2y-18$	0
$3(2)+2(6)-18$	
$6+12-18$	
$18-18$	
0	

LS = RS, graph is correct

Determining the Slope of a Line Given Its Equation in General Form

(switch to Standard!)

Ex. 3) a) Determine the slope of the line with the equation $3x - 2y - 16 = 0$

change to standard $3x - 2y = 16$

2 methods

method 1

turn into slope-intercept

$\overset{-3x}{3x} - 2y = 16^{-3x}$

$\frac{-2y}{-2} = \frac{-3x}{-2} \frac{+16}{-2}$

$\boxed{y = \frac{3}{2}x - 8},$ so $m = \frac{+3}{2}$

method 2

shortcut!

In General or Standard Form,

slope $= \frac{-A}{B}$ ... always!

so, put x coeff. on top, y coeff. on bottom, and use opp sign than one between x and y terms.

$\underset{\text{top}}{③}x \ominus \underset{\text{bottom}}{②}y = 16$ switch

$m = \frac{+3}{2}$

b) Determine the slope of the line with the equation $5x - 2y + 12 = 0$

standard $\overset{\text{top}}{⑤}x \ominus \overset{\text{bottom}}{②}y = -12$ switch

try shortcut

slope $= \frac{-A}{B} = +\frac{5}{2}$

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

check: $\overset{-5x}{5x} - 2y = -12^{-5x}$

$\frac{-2y}{-2} = \frac{-5x}{-2} \frac{-12}{-2}$

$y = \frac{5}{2}x + 6$ it works!

c) Determine the slope AND the y-intercept of the line with the equation $4x - 6y = 0$, then graph the line.

since we need slope AND y-int, just turn into slope-intercept form.

$\overset{-4x}{4x} - 6y = 0^{-4x}$

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

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

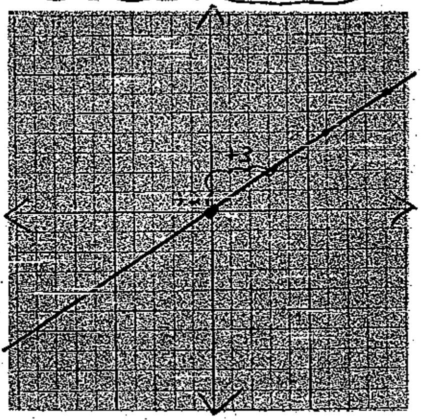
but, we can write as ...

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

slope $= \frac{2}{3}$ y-int $= 0$

shortcut for slope:

$m = \frac{-A}{B} = \frac{+4}{6} = \frac{2}{3}$ ✓



place point @ y-int = 0, from there, $m = \frac{2}{3}$, so up 2, right 3.

* connect w/ruler

Reflection: Why can't you use intercepts to graph the equation $4x - y = 0$? (where $C = 0$)

6.7 – Graphing Linear Functions from all Three Forms

Name: Notes Key
Date:

Goal: to recognize the different forms of linear functions, and to graph them using the easiest method

Toolkit:

- Slope/y-intercept form $y = mx + b$
- Point-slope form $y - y_1 = m(x - x_1)$
- ~~General~~ → Standard form

~~$Ax+By+C=0$~~ → $Ax + By = C$ ☺

Main Ideas:

Ex 1) Label each linear equation as either "mx + b", "pt-slope" or "standard":

$y - 4 = 5(x - 3)$	$y = -3x + 5$	$2x + 3y = 9$	$y + 1 = \frac{3}{4}(x + 2)$
pt slope	$y = mx + b$	standard	pt slope
$2x - y = -4$	$y - \frac{1}{2} = x - 5$	$y = \frac{1}{2}x - \frac{3}{4}$	$y = 0.4x - 0.15$
Standard	pt slope	$y = mx + b$	$y = mx + b$

What is the best way to graph an equation in $y = mx + b$ form?

Ex2) Graph the equation $y = -\frac{3}{2}x + 6$

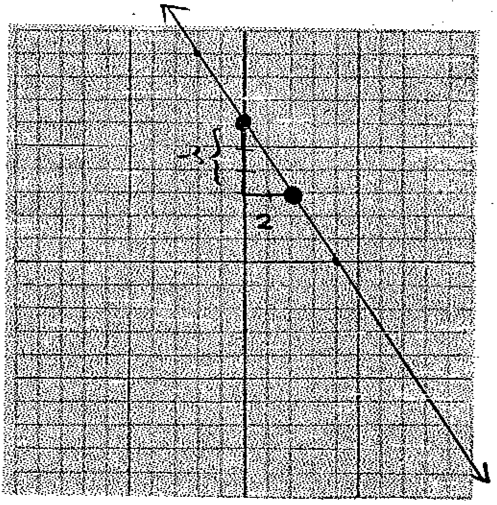
Step 1: decide what form it is in: $y = mx + b$ state $m = \frac{-3}{2}$ and $b = +6$

Step 2: for $y = mx + b$, put a **point** on the y-axis at "b". (up 6!)

Step 3: use the slope $\left(m = \frac{-3}{2} = \frac{rise}{run}\right)$ to count up/[✓ down] 3 and over 2 to a new **point**

Step 4: connect the dots!

$y = mx + b$
- start at b
- go up/down and over using slope
- connect the dots!



Hint: if you like y = mx + b, you can change any function to y = mx + b form and use this method!

What is the best way to graph an equation in point-slope form?

$y - -1 \quad x - x_1$

Ex 3) Graph the equation $y + 1 = \frac{3}{4}(\overset{x - -2}{x + 2})$ (x_1, y_1) $(-2, -1)$

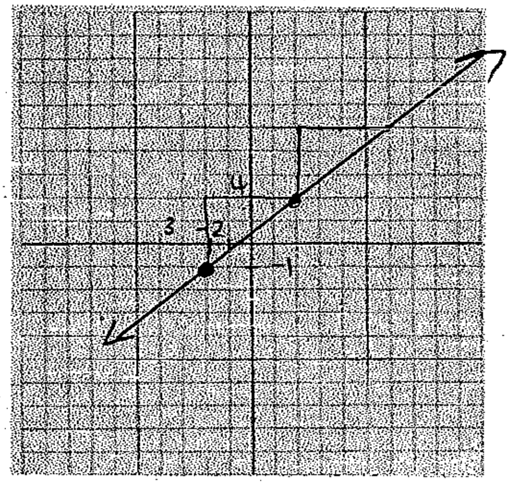
Step 1: decide what form it is in: pt-slope *point* = and *slope* = $\frac{3}{4}$

Step 2: for *point-slope*, draw in the **point** $(-2, -1)$

Step 3: use the slope $\left(m = \frac{3}{4} = \frac{rise}{run}\right)$ to count [✓ up]/down 3 and over 4 to a new **point**

Step 4: connect the dots!

point-slope
- start at the point
- go up/down and over using slope
- connect the dots!



What is the best way to graph an equation in standard form?

Ex 4) Graph the equation $2x + 3y - 6 = 0 \rightarrow 2x + 3y = 6$

Step 1: decide what form it is in: Standard note: *slope* = $-\frac{2}{3}$

Step 2: for *standard form*, find the intercepts (cover x to get y, cover y to get x)

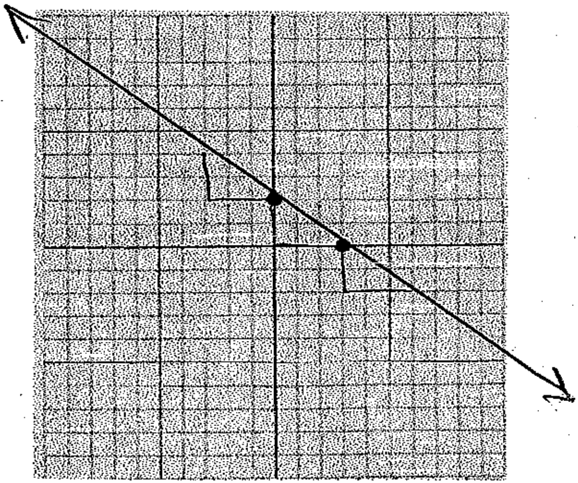
x-int = 3 *y-int* = 2

Step 3: plot x- and y-intercepts

(3,0) (0,2)

Step 4: connect the dots! (Can check slope) ✓

standard form
- get intercepts
- plot intercepts
- connect the dots!



Reflection: Which form of equation do you prefer to graph? Up to you!

Would you change every equation to your preferred form, or use the different methods for the different ones? (You may want to try a few in the homework before you answer!)

6.8 – Equations of Parallel and Perpendicular Lines

Name: Notes
Date: key

Goal: to recognize the different forms of linear functions, and to graph them using the easiest method

Toolkit:

- slopes of parallel lines are
  equal!

- slopes of perpendicular lines are

  negative reciprocals!
  (change sign) (flip)
- to find the equation of a line, you need:
  - slope
  - a point
- passing through → sub in!

Main Ideas:

Ex 1) For a line with the slope 0.7, $m = \frac{7}{10}$ what is the **slope** of a line that is

a) Parallel?

$m_{\parallel} = 0.7$ or $\frac{7}{10}$

b) Perpendicular?

flip, change sign! $m_{\perp} = \frac{-10}{7}$

Ex 2) State the **slopes** of lines that are:

a) parallel to the line $3x + 2y - 4 = 0$

$m_{line} = -\frac{3}{2}$

$\boxed{m_{\parallel} = \frac{-3}{2}}$

b) perpendicular to $y = \frac{1}{2}x - \frac{3}{4}$

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

$\boxed{m_{\perp} = -2}$

Ex 3) For this pair of slopes, what is the value of *k* if the lines are…

$\frac{4}{k}, 2$

a) Parallel? (equal)

$\frac{4}{k} = \frac{\boxed{2}}{1}$

$k = \frac{4 \times 1}{2}$

$\boxed{k = 2}$

b) Perpendicular? (neg. rec.

$\frac{4}{k} = \frac{\boxed{-1}}{2}$

$k = \frac{4 \times 2}{-1}$

$\boxed{k = -8}$

Ex 4) Are the pairs of lines parallel, perpendicular, or neither?

Check slopes!

a) $2x+3y+9=0$, $y=\frac{3}{2}x+6$

$m=\frac{-2}{3}$ $\xrightarrow{\text{neg. rec.}}$ $m=\frac{3}{2}$

∴ perpendicular!

b) $y+1=\frac{3}{4}(x+2)$, $6x-8y+3=0$

$m=\frac{3}{4}$ $\xleftrightarrow{\text{equal}}$ $m=+\frac{6\div 2}{8\div 2}=\frac{3}{4}$

∴ parallel!

Ex 5) Find the equation of the line (in $y = mx + b$ form) that is parallel to the line $2x + 3y + 9 = 0$ and has the same y-intercept as the line $y = 2x + 4$.

① write formula
② fill in what you know
(③ sub-in a point to solve for what's missing)

// to $2x+3y+9=0$ ⟹ slope!

$m=-\frac{2}{3}$ $m_{//}=-\frac{2}{3}$

y-int = same as $y=2x+4$. $b=4$

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

$b=4$

$y=mx+b$

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

Ex 6) Find the equation of the line (in $Ax + By + C = 0$ form) that is perpendicular to $y = –3x + 4$ and passes through the point (6,3).

$m=\frac{1}{3}$

pt(6,3)

perp. to $y=-3x+4$ ⟹ Slope is -3, our slope is $+\frac{1}{3}$.

passes through (6,3) (subin!)

Choose eq'n: (only do one ☺)

$y=mx+b$

$y=\frac{1}{3}x+b$ sub in (6,3)

$3=\frac{1}{3}(6)+b$

$3=2+b$

$b=1$

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

Rewrite!

$(3)y=\frac{1}{3}^{(3)}x+1^{(3)}$

$3y=x+3$

$\boxed{0=x-3y+3}$

OR

$Ax+By=C$

$1x-3y=C$

$1(6)-3(3)=C$

$6-9=C$

$-3=C$

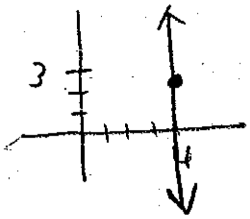
$1x-3y=-3$

$\boxed{x-3y+3=0}$

Ex 7) Find the equation of the line that is perpendicular to the x-axis and passes through the point (4 , 3)

x-axis ↕ vert. lines are perp.! always $x=$ number

must be $x=4$



Reflection: What short-cuts have you picked up this unit to make answering the questions faster?

→ $Ax+By=C$ $m=-\frac{A}{B}$

→ if they give you y-int., use it!

others?