Name Key Date _____ Period _____

Lines in the Coordinate Plane

Lesson Objective

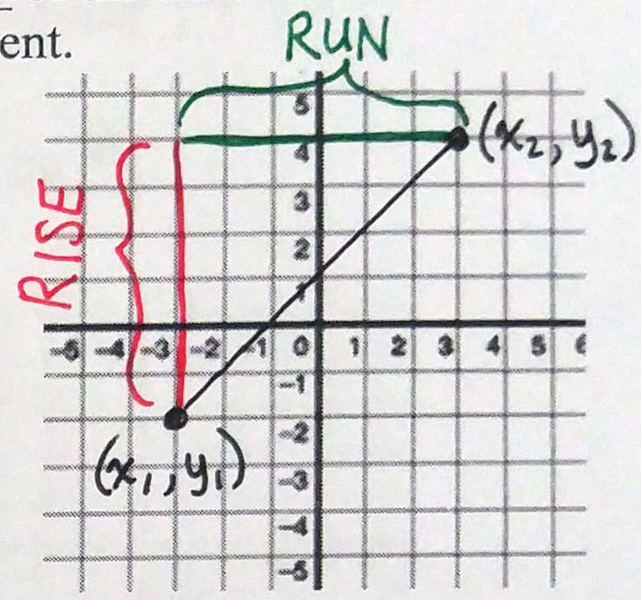
FIND AND USE SLOPES OF LINES TO DETERMINE IF LINES ARE // OR ⊥;
GRAPH LINES.

Algebra 1 Review

In Algebra 1, you learned how to find the slope of a line in the coordinate plane.

Slope: The slope of a line is a number that describes the STEEPNESS of the line.

➔ ANY two points can be used to determine the slope of a line or line segment.



The RISE is the difference in the y-values

The RUN is the difference in the x-values

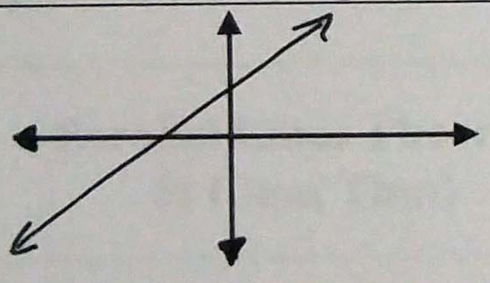
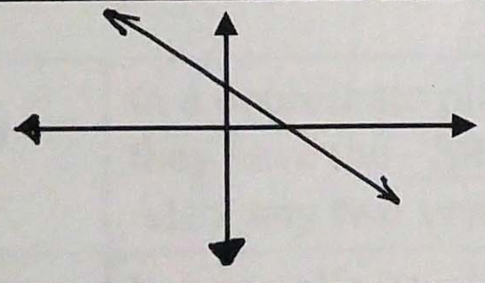
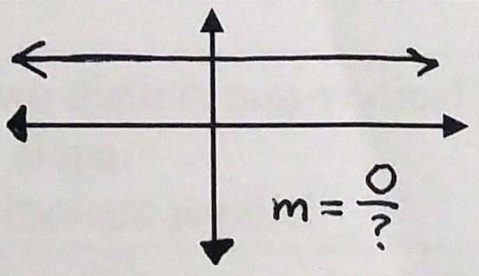
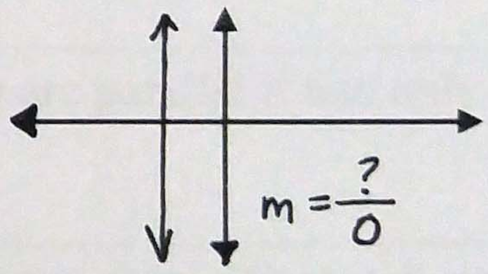
The SLOPE is the RATIO of the RISE to the RUN.

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

Examples:

1. Use the slope formula to determine the slope of $\overline{GH}$ if G(2, 3) and H(7, 5).
   $x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-3}{7-2} = \frac{2}{5}$$

Summary: Slope of a Line			
Positive Slope	Negative Slope	Zero Slope	Undefined Slope
			

More Algebra 1 Review

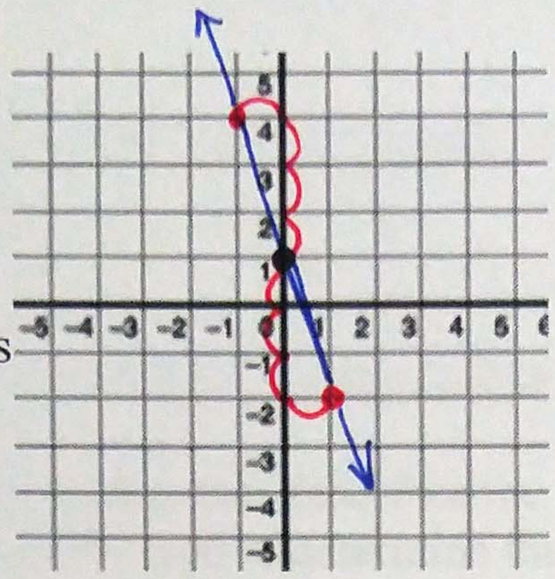
In Algebra 1, you learned how to graph lines in the coordinate plane using these formulas:

#1	**Slope-Intercept Form**	$y = mx + b$	m is the slope b is the y-intercept
#2	**Point-Slope Form**	$y - y_1 = m(x - x_1)$	m is the slope (x_1, y_1) is a point on the line

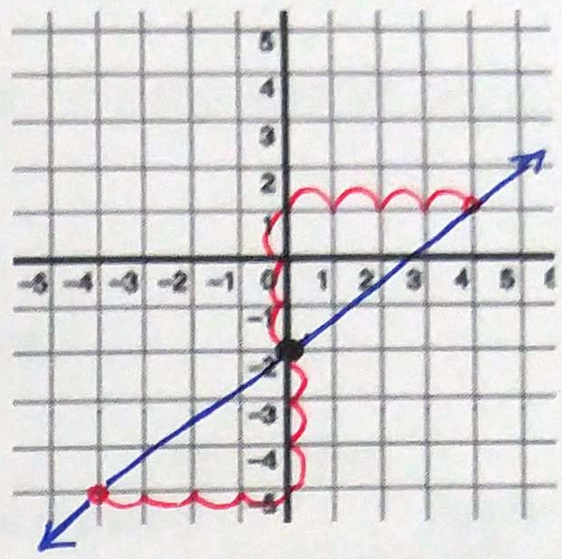
Graphing #1: Slope-Intercept Form

2. $y = -3x + 1$ — $m = -3 = \frac{-3}{1}$ OR $\frac{3}{-1}$; $b = 1$

(1) Graph the y-int (b)
(2) From the y-int, plot new points using the slope (m) "rise/run"
(3) Make at least 3 points
(4) Connect the points with a straightedge



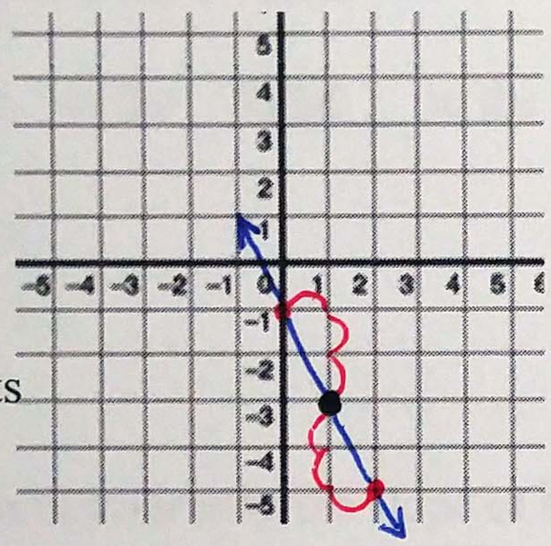
3. $y = \frac{3}{4}x - 2$ — $m = \frac{3}{4}$ OR $\frac{-3}{-4}$; $b = -2$



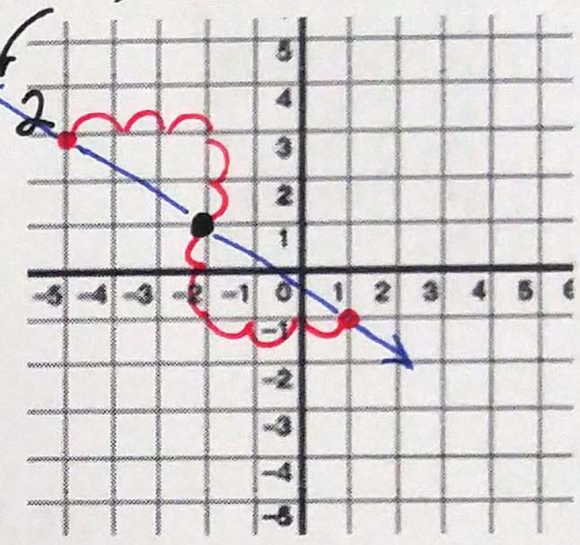
Graphing #2: Point-Slope Form

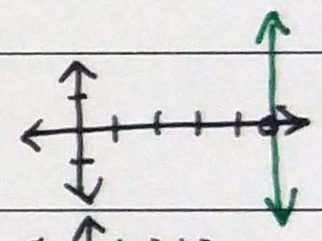
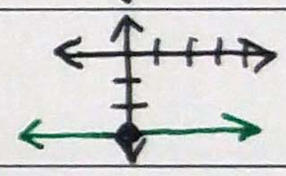
4. $y + 3 = -2(x - 1)$ — $m = -2 = \frac{-2}{1}$ OR $\frac{2}{-1}$; $y_1 = -3$; $x_1 = 1$

(1) Graph the point (x_1, y_1)
(2) From this point, plot new points using the slope (m) "rise/run"
(3) Make at least 3 points
(4) Connect the points with a straightedge



5. $y - 1 = -\frac{2}{3}(x + 2)$ — $m = \frac{-2}{3}$ OR $\frac{2}{-3}$; $y_1 = -1$; $x_1 = -2$



Vertical Lines	The equation of a vertical line is $x = h$, where h is the x - intercept.	Example: $x = 5$ 
Horizontal Lines	The equation of a vertical line is $y = k$, where k is the y - intercept.	Example: $y = -3$ 

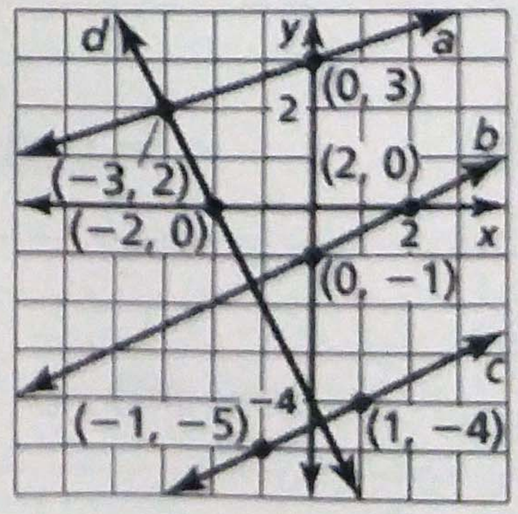
Connecting it to Geometry

Parallel Lines Theorem (∥ Lines Thm)	In a coordinate plane, two distinct non-vertical lines are parallel if and only if they have the SAME slope. Also, any two vertical lines are parallel.
Perpendicular Lines Theorem (⊥ Lines Thm)	In a coordinate plane, two distinct non-vertical lines are perpendicular if and only if the PRODUCT of their slopes is -1. Also, horizontal lines are perpendicular to vertical lines. *PRODUCT = MULTIPLY

"NEGATIVE RECIPROCALS" ie $\frac{2}{3}$ AND $-\frac{3}{2}$

Example:

6. Determine which of the lines are parallel and which of the lines are perpendicular.



$m_{(a)} = \frac{3-2}{0-(-3)} = \frac{1}{3}$

$m_{(b)} = \frac{0-(-1)}{2-0} = \frac{1}{2}$

$m_{(c)} = \frac{-4-(-5)}{1-(-1)} = \frac{1}{2}$

$m_{(d)} = \frac{2-0}{-3-(-2)} = \frac{2}{-1} = -2$

b ∥ c : SAME SLOPE

b ⊥ d AND : $(\frac{1}{2})(-2) = -1$

c ⊥ d