Algebra 1 Lesson 4.1/4.2 Notes
Coordinate Plotting, Special Lines, Graphing with T-Charts, Check for Solution

Name KEY

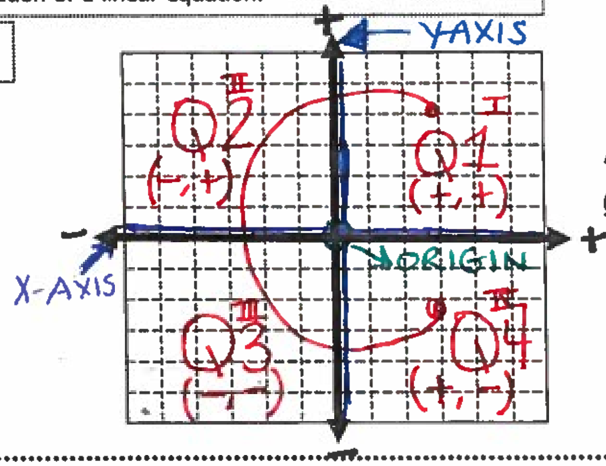
Objectives:
- Identify and label all the parts of a coordinate plane.
- Correctly identify and plot an ordered pair.
- Graph horizontal and vertical lines.
- Use a t-chart to graph a linear equation.
- Check if an ordered pair is a solution of a linear equation.

X - MOVES LEFT OR RIGHT

Y - MOVES UP OR DOWN

4.1 Cartesian/Coordinate Plane

Label the following:
- x-axis
- y-axis
- Quadrants
- Origin



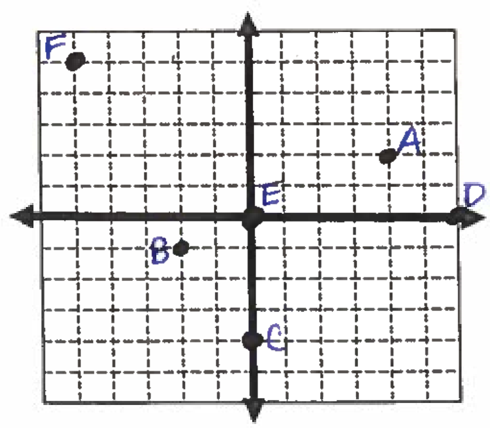
Any point on the plane is called a ORDERED PAIR (x, y)

IF POINT IS ON X-AXIS (#, 0)

IF POINT IS ON Y-AXIS (0, #)

Practice 1: Plot the following ordered pairs and list their location on the coordinate plane.

ORDERED PAIR	LOCATION
A (4, 2)	QI
B (−2, −1)	QIII
C (0, −4)	Y-AXIS
D (6, 0)	X-AXIS
E (0, 0)	ORIGIN
F (−5, 5)	QII



4.2 Graph 'special' lines *(horizontal/vertical lines)*

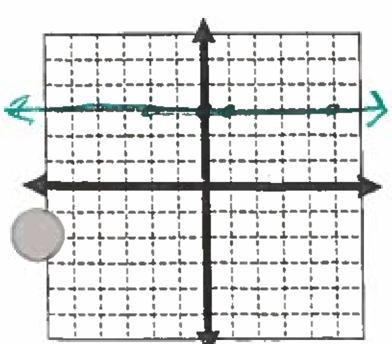
HORIZONTAL LINES: all y-values are the same.

Horizontal Lines: Think **HOY!** ← HORIZONTAL LINES (L/R) →

HOY: HORIZONTAL, Ø slope, Y =

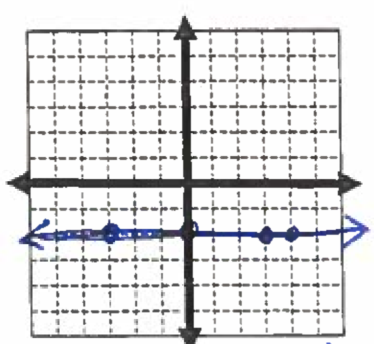
Equation: Y = NUMBER

Example 1: $y = 3$



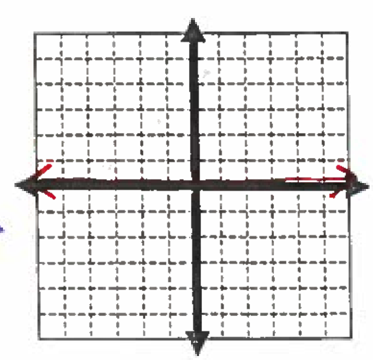
(1, 3) (0, 3)
(2, 3) (5, 3)

Example 2: $y = -2$

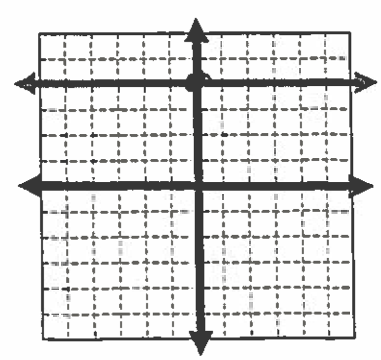


(0, −2) (3, −2)
(−2, −2) (4, −2)

Example 3: $y = 0$



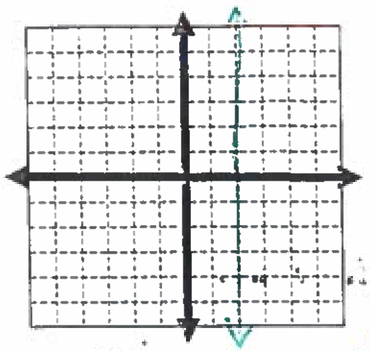
Example 4: Equation? Y = 4



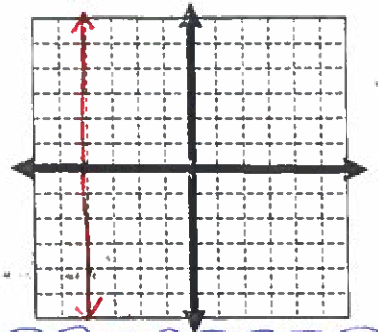
Vertical Lines: Think VUX! → VUX: VERTICAL, UNDEFINED SLOPE, X =

Equation: X = NUMBER (UP / DOWN)

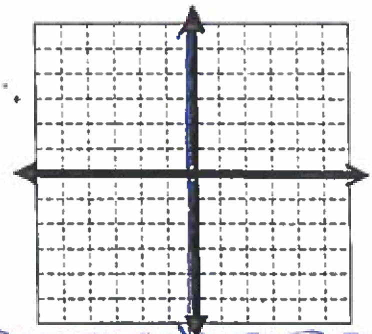
Example 1: $x = 2$



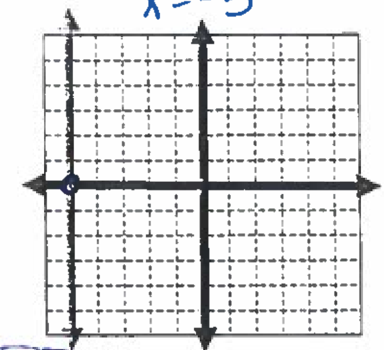
Example 2: $x = -4$



Example 3: $x = 0$



Example 4: Equation? $X = -5$



Remember: HOY VUX!

Graphing with T-Charts:

Steps:

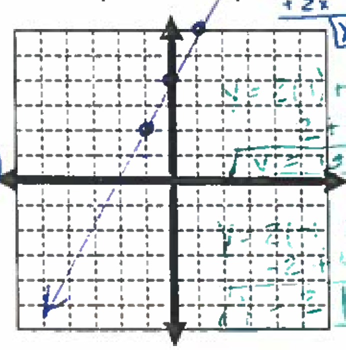
1. Solve for Y.
2. Create a T-chart (also call an X / Y table)
   - Always use -1, 0, 1 for the domain! (X-VALUES)
3. Plot the points and draw the line using a straight edge!

Example 1: Graph $-2x + y = 4$

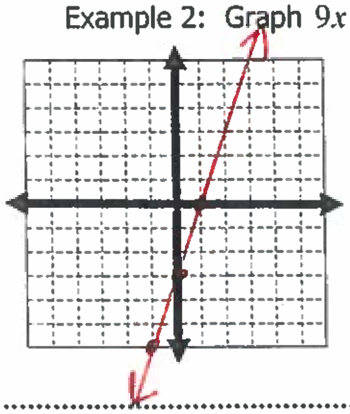
$+2x \quad +2x$

$y = 2x + 4$

X	Y
-1	2
0	4
1	6



Example 2: Graph $9x - 3y = 9$



X	Y
-1	-6
0	-3
1	0

$9x - 3y = 9$

$-9x \quad -9x$

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

$y = 3x - 3$

$y = 3(-1) - 3$

$-3 - 3$

$y = -6$

$y = 3(0) - 3$

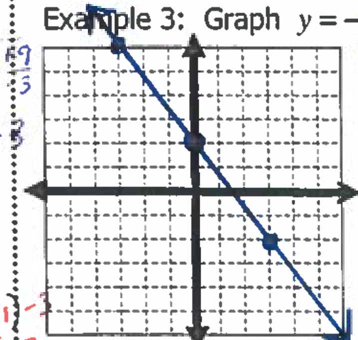
$y = -3$

$y = 3(1) - 3$

$3 - 3$

$y = 0$

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



X	Y
-3	6
0	2
3	-2

$y = \left(-\frac{4}{3}\right)(0) + 2$

$y = 2$

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

$y = -4 + 2$

$y = -2$

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

$y = 4 + 2$

If the coefficient of x is a fraction, use the DENOMINATOR as the input!

Checking Linear Solutions

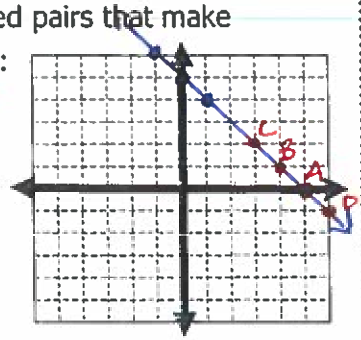
Example 1: Find the ordered pairs that make the equation $x + y = 5$ true:

$-x \quad -x$

$y = -x + 5$

A (5, 0) ✓
B (4, 1) ✓
C (3, 2) ✓
D (6, −1) ✓

X	Y
-1	6
0	5
1	4



Every POINT on the line is a solution!

Example 2: Is (3, 4) a solution to: $3x - y = 7$?

(3, 4) IS NOT A SOLUTION

$3(3) - 4 = 7$

$9 - 4 = 7$

$5 \neq 7$

Example 3: $3x - y = 7$; (1, −4)

$3(1) - (-4) = 7$

$3 + 4 = 7$

YES

Which one will not have the point on the line? Example 2 or 3?

Algebra 1 Lesson 4.3 Notes
Intercepts, Domain & Range

Name KEY

X-INTERCEPT - WHERE THE LINE CROSSES X-AXIS → HAS A Y VALUE OF Ø

Y-INTERCEPTS - WHERE THE LINE CROSSES Y-AXIS → HAS A X VALUE OF Ø

Objectives:

- Find the x and y intercepts of a line.
- Graph a line using x and y intercepts.
- Identify the domain and range of a function.
- Write the domain and range of a function in set notation.

4.3 Finding x and y Intercepts

x-intercept (# , 0):

y-intercept (0, #):

X INTERCEPTS ARE WHERE THE LINE CROSSES THE X-AXIS OR Y-AXIS

FINDING INTERCEPTS

Step 1: Plug in Ø for the opposite variable.

Step 2: Solve equation for remaining variable.

Step 3: Write answer as an ORDERED PAIRS

Example 1: Find the **x-intercept** of $2x+3y=6$.

Step 1: $2x+3(0)=6$ → y-value = Ø (#, Ø)

$2x+0=6$

$\frac{2x}{2}=\frac{6}{2}$

$x=3$

Ordered Pair: (3, 0)

Example 2: Find the **y-intercept** of $2x+3y=6$.

Step 1: $2(0)+3y=6$ → x-value = Ø (Ø, #)

$0+3y=6$

$\frac{3y}{3}=\frac{6}{3}$

$y=2$

Ordered Pair: (0, 2)

Practice 1: Find the x and y-intercepts of the following equations:

a) $2x+3y=12$

$2x+3(0)=12$, $\frac{2x}{2}=\frac{12}{2}$, $x=6$ — X-INTERCEPT (6, 0)

$2(0)+3y=12$, $\frac{3y}{3}=\frac{12}{3}$, $y=4$ — Y-INTERCEPT (0, 4)

b) $5x+4y=20$

$5x+4(0)=20$, $\frac{5x}{5}=\frac{20}{5}$, $x=4$ — X-INTERCEPT (4, 0)

$5(0)+4y=20$, $\frac{4y}{4}=\frac{20}{4}$, $y=5$ — Y-INTERCEPT (0, 5)

c) $-3y+4x=24$

$-3(0)+4x=24$, $\frac{4x}{4}=\frac{24}{4}$, $x=6$ — X-INTERCEPT (6, 0)

$-3y+4(0)=24$, $\frac{-3y}{-3}=\frac{24}{-3}$, $y=-8$ — Y-INTERCEPT (0, -8)

d) $y=2x-10$

$y=2(0)-10$, $y=-10$ — Y-INTERCEPT (0, -10)

$0=2x-10$, $+10$ $+10$, $\frac{10}{2}=\frac{2x}{2}$, $5=x$ — X-INTERCEPT (5, 0)

4.3 Graphing Using x and y Intercepts

Step 1: Find the intercepts *(see above)*

Step 2: Plot them!

Step 3: Draw line using a STRAIGHT EDGE.

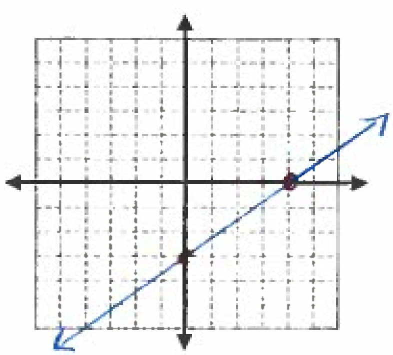
Example 1: Graph $3x-4y=12$ using intercepts.

X INT: (4, 0)

Y INT: (0, -3)

$3x-4(0)=12$, $\frac{3x}{3}=\frac{12}{3}$, $x=4$

$3(0)-4y=12$, $\frac{-4y}{-4}=\frac{12}{-4}$, $y=-3$



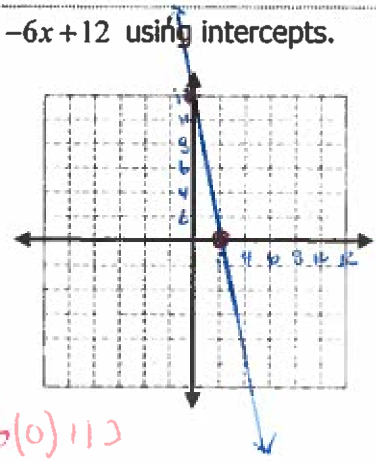
Example 2: Graph $y=-6x+12$ using intercepts.

X-INT: (2, 0)

Y-INT: (0, 12)

$0=-6x+12$, -12 -12, $\frac{-12}{-6}=\frac{-6x}{-6}$, $2=x$

$y=-6(0)+12$, $y=12$



* DOMAIN: THE X-VALUES OF A RELATION OR FUNCTION

Domain & Range

* RANAGE: THE Y-VALUES OF A RELATIONS OR FUNCTION

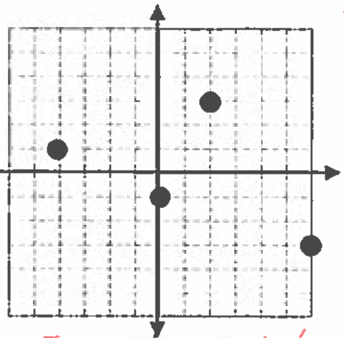
USE { } SET NOTATION WHEN FUNCTION IS ORDERED PAIRS

Discrete Functions: MADE OF JUST ORDERED PAIRS

ANSWERS FOR DOMAIN/RANGE IN { } SOLUTION SET

List the domain & range of the discrete functions.

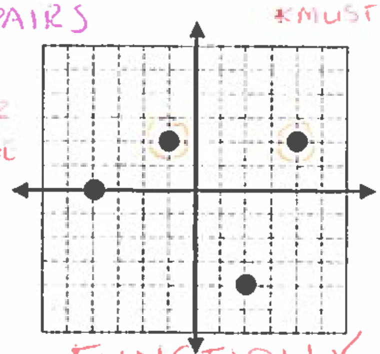
*MUST PASS VERTICAL LINE TEST



FUNCTION ✓

Domain: {-4, 0, 2, 6}

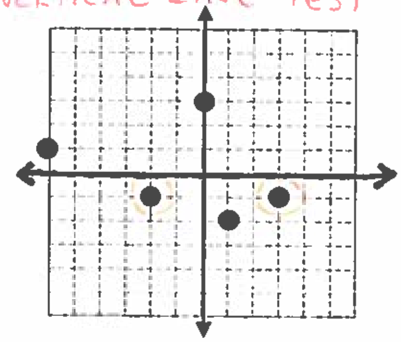
Range: {1, -1, 3, -3}



FUNCTION ✓

Domain: {-4, -1, 2, 4}

Range: {0, 2, -4} (YOU DO NOT LIST THE # TWICE)



Domain: {-6, -2, 0, 1, 3}

Range: {-2, -1, 1, 3}

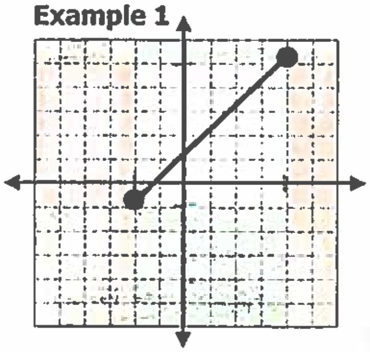
Continuous Functions: A FUNCTION THAT CAN BE CONSTRUCTED WITHOUT PICKING UP YOUR PENCIL!

Domain: Find the smallest and largest *x*-values on the graph (left to right) →

Range: Find the smallest and largest y-values on the graph (bottom to top) ↑

****Write answers as** INEQUALITIES **!!**

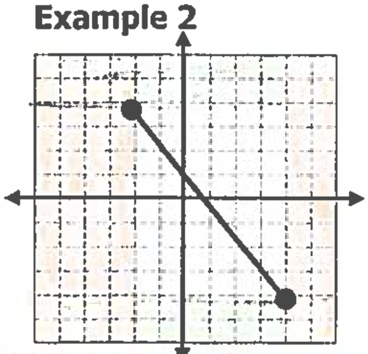
Example 1



Domain: $-2 \le x \le 4$ "DOMAIN IS FROM -2 TO 4"

Range: $-1 \le y \le 5$ "RANGE IS FROM -1 TO 5"

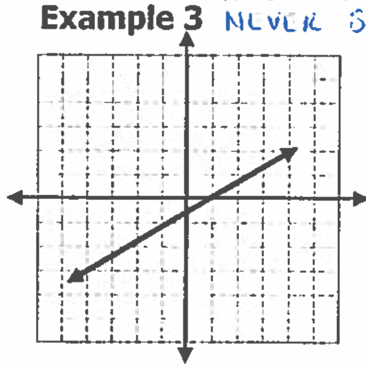
Example 2



Domain: $-2 \le x \le 4$

Range: $-4 \le y \le 4$

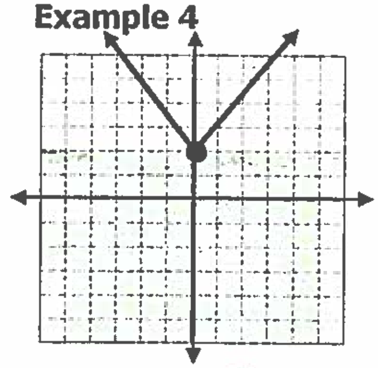
Example 3 THIS FUNCTION NEVER STOPS



Domain: ℝ "all real numbers"

Range: ℝ

Example 4



Domain: ℝ

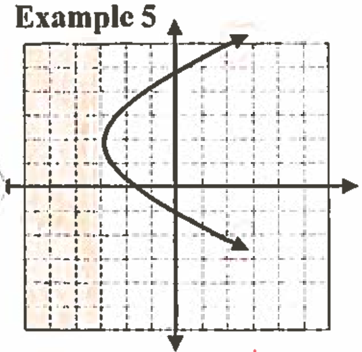
Range: $y \ge 2$

WHEN YOU HAVE ONLY ONE BARRIER YOU NEED ONLY ONE INEQUALITY

* ANYTIME YOUR INBETWEEN YOU USE ≤ ≤

* WHEN FUNCTION NVER STOPS USE ℝ (all real #'s)

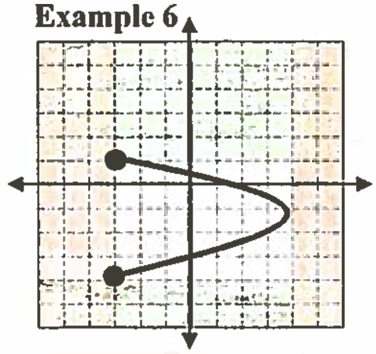
Example 5



Domain: $X \geq -3$

Range: $\mathbb{R}$

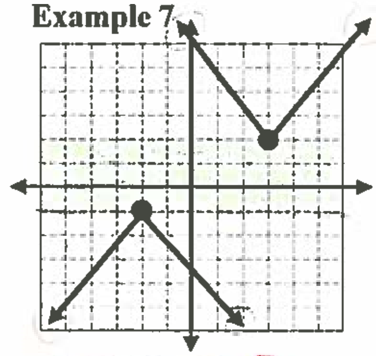
Example 6



Domain: $-3 \leq x \leq 4$

Range: $-4 \leq y \leq 1$

Example 7



Domain: $\mathbb{R}$

Range: $y \leq -1$ OR $y \geq 2$

GETTING SMALLER = $\leq$

GETTING BIGGER = $\geq$

● Use the ≤ or ≥ symbol.

○ Use the < or > symbol.

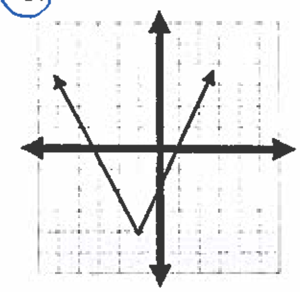
DOMAIN THE X-VALUES (LEFT TO RIGHT →)

RANGE THE Y-VALUES (BOTTOM TO TOP ↑)

Domain & Range

Find the domain and range of each graph. Circle the question # if the graph is a function!

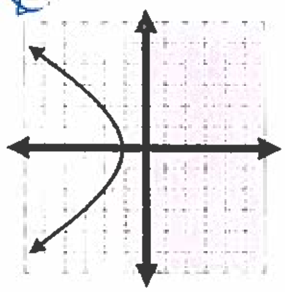
(1.) FUNCTION



Domain = ℝ

Range = $y \geq -4$

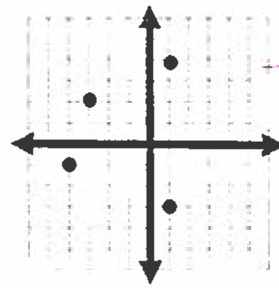
(2.) NOT A FUNCTION



Domain = $x \leq -1$

Range = ℝ

3. NOT A FUNCTION



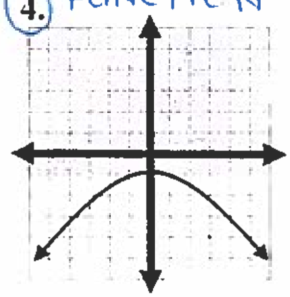
→ DISCRETE FUNCTION

* A BUNCH OF POINTS!!

Domain = $\{-4, -3, 1\}$

Range = $\{-3, -1, 2, 4\}$

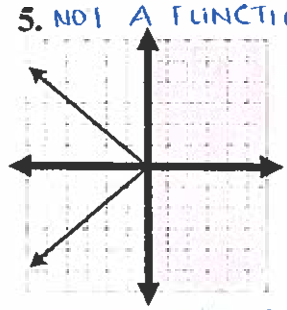
(4.) FUNCTION



Domain = ℝ

Range = $y \leq -1$

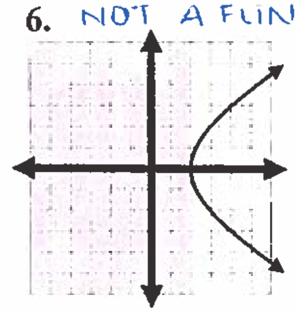
5. NOT A FUNCTION



Domain = $x \leq 0$

Range = ℝ

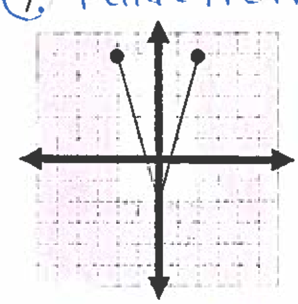
6. NOT A FUNCTION



Domain = $x \geq 2$

Range = ℝ

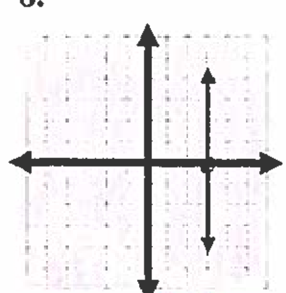
(7.) FUNCTION



Domain = $-2 \leq x \leq 2$

Range = $-2 \leq y \leq 5$

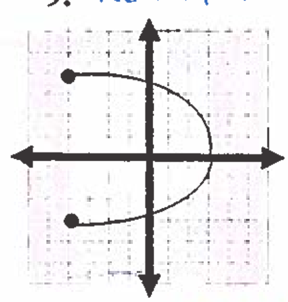
8.



Domain = $\{3\}$

Range = ℝ

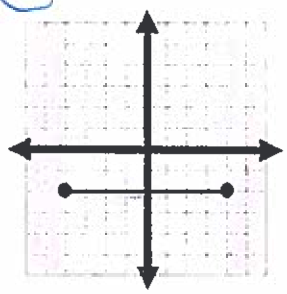
9. NOT A FUNCTION



Domain = $-4 \leq x \leq 3$

Range = $-3 \leq y \leq 4$

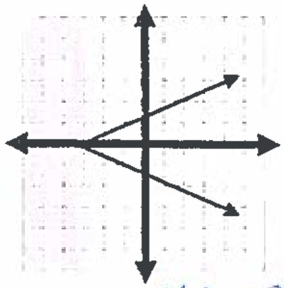
10.



Domain = $-4 \le x \le 4$

Range = $\{-2\}$

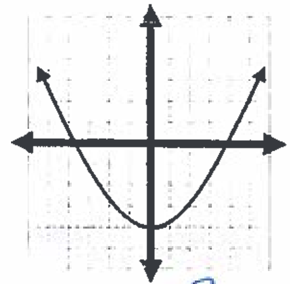
11.



Domain = $x \ge -3$

Range = $\mathbb{R}$

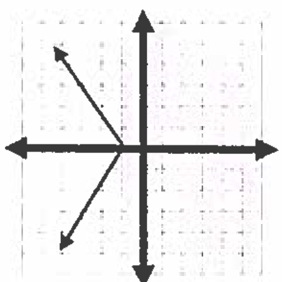
12.



Domain = $\mathbb{R}$

Range = $y \le -4$

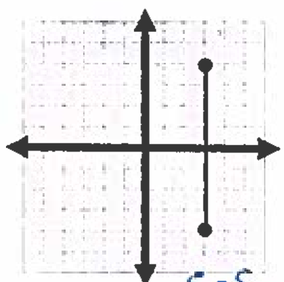
13.



Domain = $x \le -1$

Range = $\mathbb{R}$

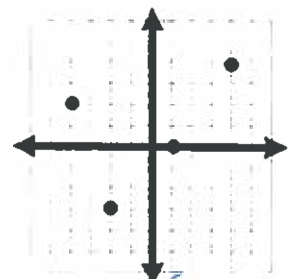
14.



Domain = $\{3\}$

Range = $-4 \le y \le 4$

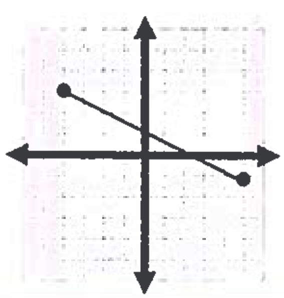
15.



Domain = $\{-4, 2, 1, 4\}$

Range = $\{-3, 0, 2, 4\}$

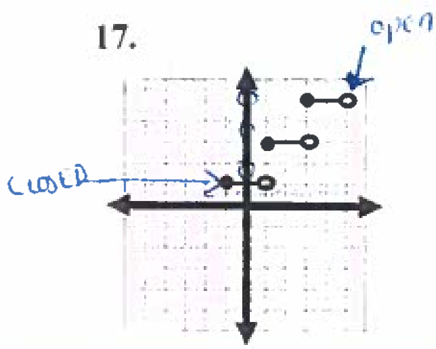
16.



Domain = $4 \le x \le 5$

Range = $-1 \le y \le 3$

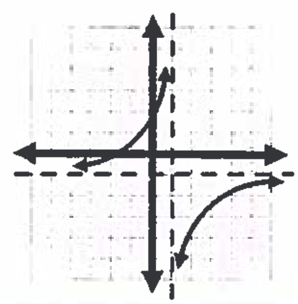
17.



Domain = $-1 \le x < 5$

Range = $\{1, 3, 5\}$

18.



Domain = $x < 1$ OR $x > 1$

Range = $y < -1$ OR $y > -1$

Algebra 1 Lesson 4.4 Notes

Finding Slope of a Line

Name KEY

Objectives:
- Count the slope from the graph of a line.
- Use the slope formula to determine the slope of a line.
- Determine the slope of horizontal and vertical lines.
- Find a missing coordinate value given the slope and another point.

4.4 Slope – Counting Method

Slope is the steepness of a line on a graph.

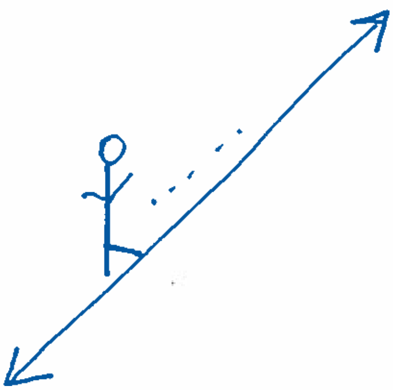
Always read slope from LEFT to RIGHT, just like a book.

If the line is rising, the slope is POSITIVE

If the line is falling, the slope is NEGATIVE

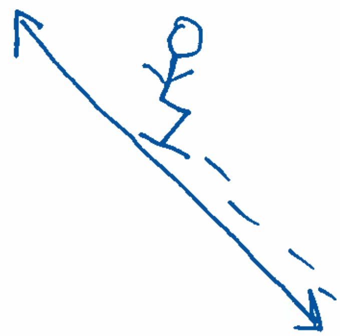
DRAW A PICTURE

Positive Slope:



Think of going up a hill!

Negative Slope:



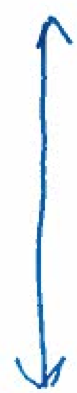
Think of skiing down a mountain.

Zero Slope:

Think of:

walking across a flat foor

Undefined Slope:



Think of:

HOW TO COUNT SLOPE ON A GRAPH: THINK "RISE OVER RUN" $\frac{\text{RISE}}{\text{RUN}}$

1) Pick a **nice point** (CLEAR ORDERED PAIR) on the left and a **nice point** on the right.

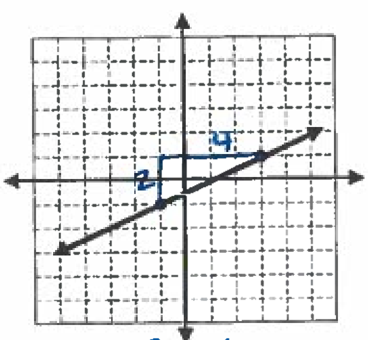
2) **COUNT YOUR RISE:** Start on the left. How much do you have to go UP or DOWN to get to the next point? This is your RISE.

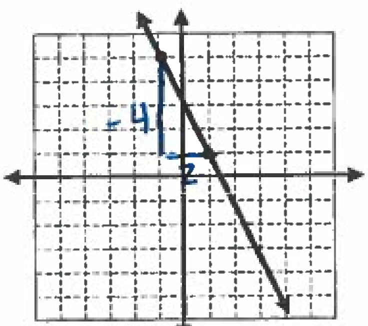
If your rise goes up, it is POSITIVE. If your rise goes down, it is NEGATIVE.

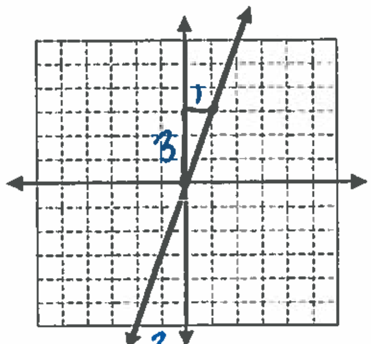
3) **COUNT YOUR RUN:** How much do you have to go RIGHT to get to your other point? This is your RUN.

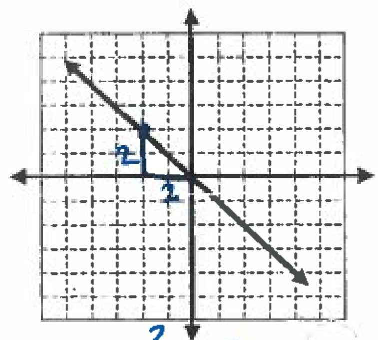
4. **SLOPE IS RISE OVER RUN!** Write your slope as a fraction.
REDUCE your fraction if necessary.

What is the slope of the following lines?

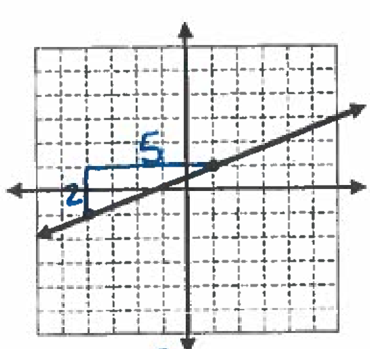

Slope: $\frac{2}{4} = \frac{1}{2}$

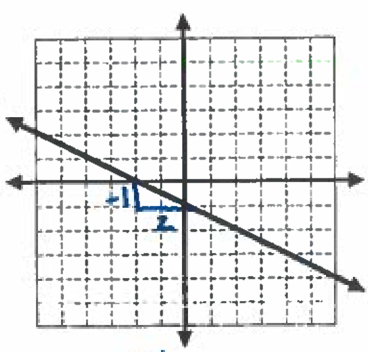

Slope: $-\frac{4}{2} = -2$

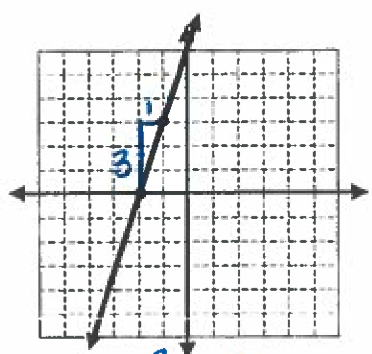

Slope: $\frac{3}{1} = 3$

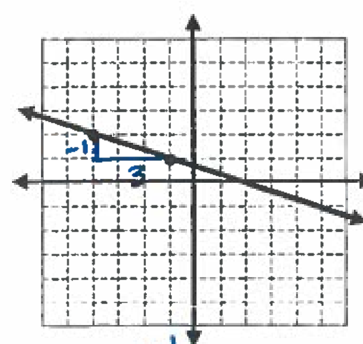

Slope: $\frac{2}{2} = 1$

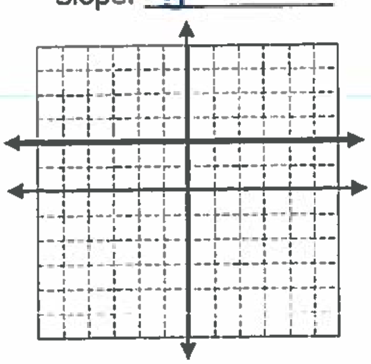
Practice 1: Find the slope of the given line.

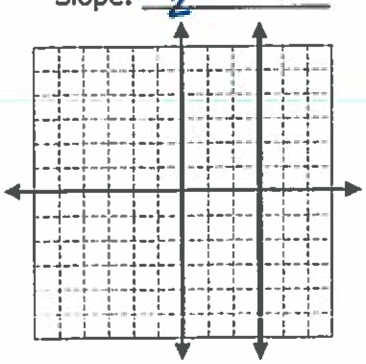

Slope: $\frac{2}{5}$

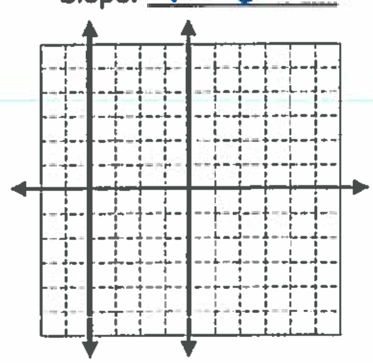

Slope: $-\frac{1}{2}$

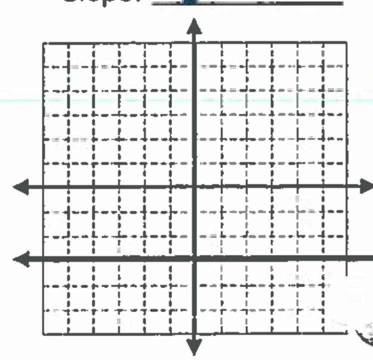

Slope: $\frac{3}{1} = 3$


Slope: $-\frac{1}{3}$


Slope: Ø


Slope: UNDEFINED


Slope: UNDEFINED


Slope: Ø

HOY = HORIZONTAL, ZERO SLOPE, Y= VUX: VERTICAL, UNDEFINE, X =

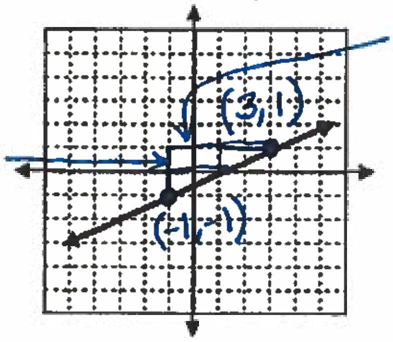
Slope – Formula Method

Since we know that slope is the RATIO of RISE to RUN, we can write this mathematically as a formula. When we count rise, we are finding the CHANGE in height between two points, or the difference in two Y values. When we count run, we are finding the CHANGE in ~~height~~ HORIZONTAL DISTANCE between two points, or the difference in two X values.

The word difference in mathematics means SUBTRACTION. (difference → CHANGE)

Let's examine: Label your ordered pairs. Count your rise and run. Label your vertical distance and horizontal distance. What do you notice?

VERTICAL DISTANCE



HORIZONTAL DISTANCE

X-VALUES: (-1) and (3)

HORIZONTAL DISTANCE: 4

$3 - -1 = 4$

Y-VALUES: (1) and (-1)

VERTICAL DISTANCE: 2

$1 - -1 = 2$

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

SLOPE = VERTICAL DISTANCE / HORIZONTAL DISTANCE

Using this idea, we can derive the formula for slope.

Slope: The ratio of the CHANGE **in** Y **to the** CHANGE **in** X.

Slope Formula: $m = \frac{\text{VERTICAL DIST.}}{\text{HORIZONTAL DIST}}$ or $m = \frac{y_1 - y_2}{x_1 - x_2}$

FOR SLOPE USE "m"

Remember: In mathematics, we cannot divide by zero!!!!!!!!!!

* "UNDEFINED" $\frac{\#}{0}$ ERROR! ← CALCULATOR

IMPOSSIBLE

IF I HAVE 15 COOKIES TO GIVE TO Ø PEOPLE, I DON'T DON'T PASS OUT MY COOKIES

THIS IS THE TERM YOU WILL USE TO ANSWER PROBLEM

$\frac{0}{\#}$ "ZERO"

I HAVE Ø COOK TO GIVE TO 15 PEOPLE = 0

Practice 2: Find the slope of the line that passes through the following points:

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

a. (4, 6) and (3, 2)

$m = \frac{6-2}{4-3} = \frac{4}{1} = 4$

$m = 4$

b. (2, 4) and (–5, 8)

$m = \frac{4-8}{2--5} = \frac{-4}{7}$

$m = \frac{-4}{7}$

c. (3, –2) and (3, 6)

$m = \frac{-2-6}{3-3} = \frac{-8}{0}$

m = UNDEFINED

d. (4, 5) and (–1, 5)

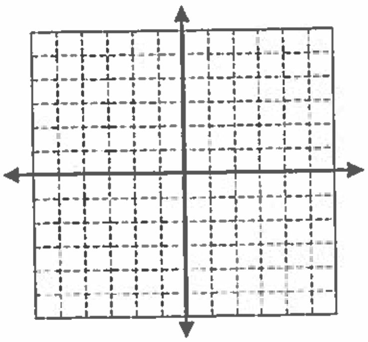
$m = \frac{5-5}{4--1} = \frac{0}{5}$

m = ZERO

Finding Missing Coordinates

Example 1: Find the value of x or y so that the line passing through the points $(-2, y)$ and $(1, -1)$ has a slope of $\frac{-4}{3}$.

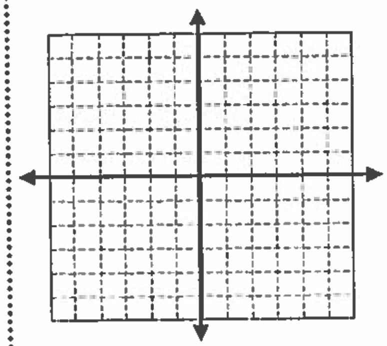
Method 1: Graphing:



Method 2: Set up a proportion:

You Try: Find the value of x or y so that the line passing through the points $(1, 2)$ and $(x, -1)$ has a slope of -3.

Method 1: Graphing:



Method 2: Set up a proportion:

Algebra 1 Lesson 4.5 Notes
Slope-intercept Form & Restricted Domains

Name KEY

Objectives:
- Identify the slope and y-intercept of a linear equation.
- Use slope-intercept form to graph a line.
- Graph a line with a restricted domain.

4.5 Slope-Intercept Form

Y = STUFF WITH X + NUMBER

Slope-intercept form:

SLOPE: COEFFICIENT (# IN FRONT OF) OF X

$$y = mx + b$$

SLOPE (m)   Y-INTERCEPT (b): POINT WHERE A LINE CROSSES Y-AXIS

Practice 1: Identify the slope and y-intercept of the linear equation.

ASK YOURSELF
* IS MY EQUATION IN SLOPE-INTERCEPT FORM

a) $y = 6x + 4$

slope: 6

y-intercept 4

b) $y = 3 - 2x$

$y = -2x + 3$

slope: -2

y-intercept 3

c) $x + y = 6$

$-x \quad -x$

$y = -x + 6$

slope: -1

y-intercept 6

d) $y = \frac{x-8}{3}$

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

slope: 1/3

y-intercept: -8/3

e) $y + 6 = 8$ HOY

$-6 \quad -6$

$y = 2$

slope: 0

y-intercept: 2

f) $x - 2 = 6$ VUX

$+2 \quad +2$

$x = 8$

slope: UNDEFINED

y-intercept: NONE

4.5 Graphing in Slope-Intercept Form

Steps to graphing from slope-intercept form:

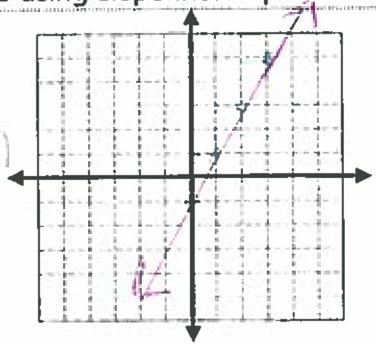
1. **Solve for *y***
2. **Identify the** SLOPE (m) **and** Y-INTERCEPT (b).
3. **Plot the y-intercept (on the** Y **-axis)**
4. **From the y-intercept, count slope for the next point (positive →** UP**, negative →** DOWN**)**
5. **Draw line using a** STRAIGHT EDGE

Practice 2: Graph the lines using slope-intercept form.

a) $y = 2x - 1$

slope: 2 → $\frac{2}{1}$ (rise/run)

y-intercept: −1

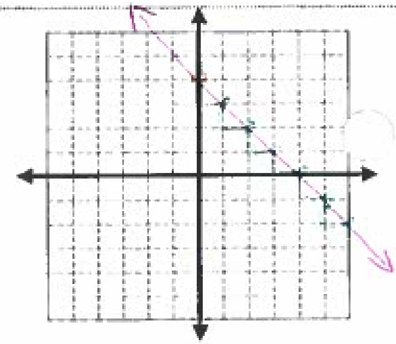


b) $x + y = 4$

$y = -x + 4$

slope: −1 → $\frac{-1}{1}$

y-intercept: 4



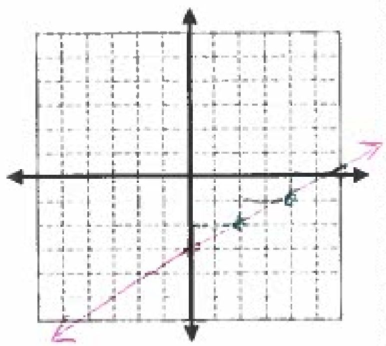
c) $3x - 6y = 18$

$-6y = -3x + 18$

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

slope: $\frac{1}{2}$

y-intercept: −3



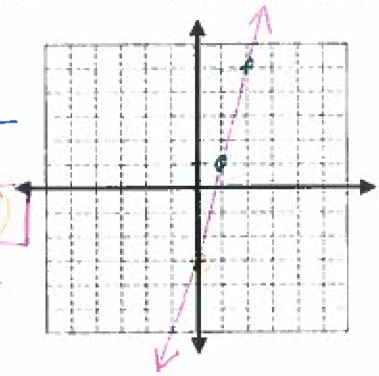
d) $4x - y - 3 = 0$

$-y = -4x + 3$

$y = 4x - 3$

slope: 4 → $\frac{4}{1}$

y-intercept: −3



Restricted Domain Lines

When graphing a line with a restricted domain, you will only be graphing a PIECE of the line.

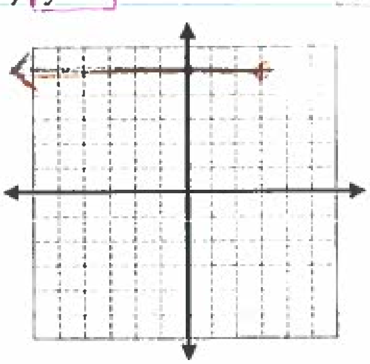
Steps to graphing a line with a restricted domain:

1. **Graph the line using slope-intercept form (be sure to continue all of the points for the length of the graph)**
2. **Erase the part of the line that is not included in the domain! Use points instead of arrows where the graph does not continue.**

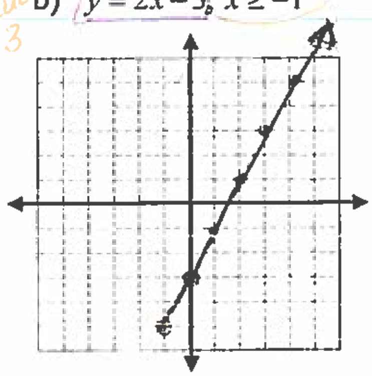
≤, ≥ = ●   <, > = ○

Practice 3: Graph the line given the restricted domain.

a) $y = 5$ with a domain of $x \leq 3$ (allowed to have all x-values less than 3)



b) $y = 2x - 3$, $x \geq -1$



c) $y = \frac{1}{2}x - 4$, $x \leq 4$