Name: _____ Date: _____ Hour: ____Alg 1__

Unit 3a Day 2: Steep Stairs

Focus Question: How does a mathematician define rate of change?

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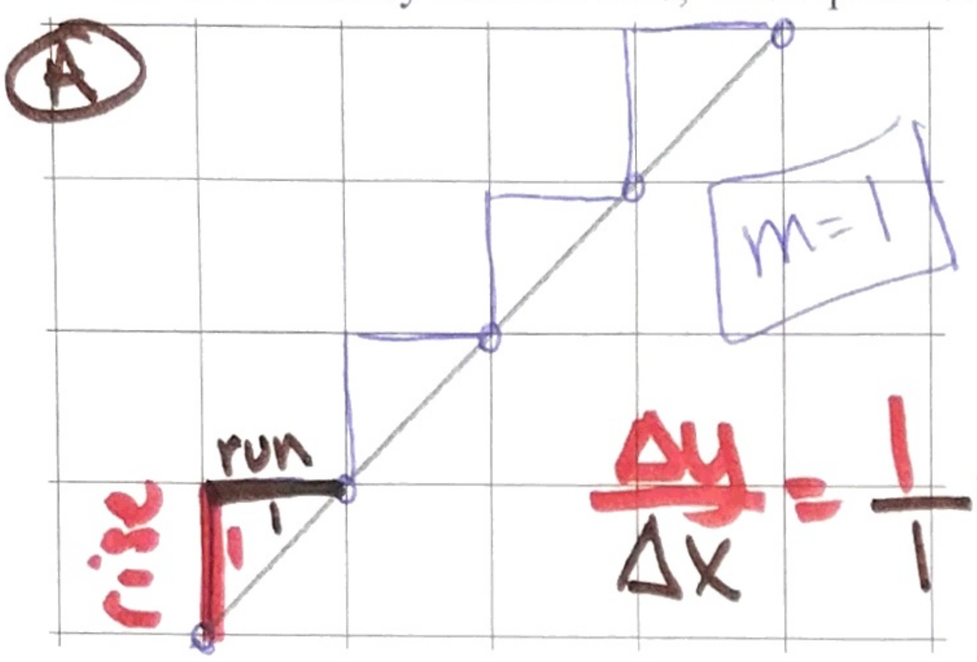
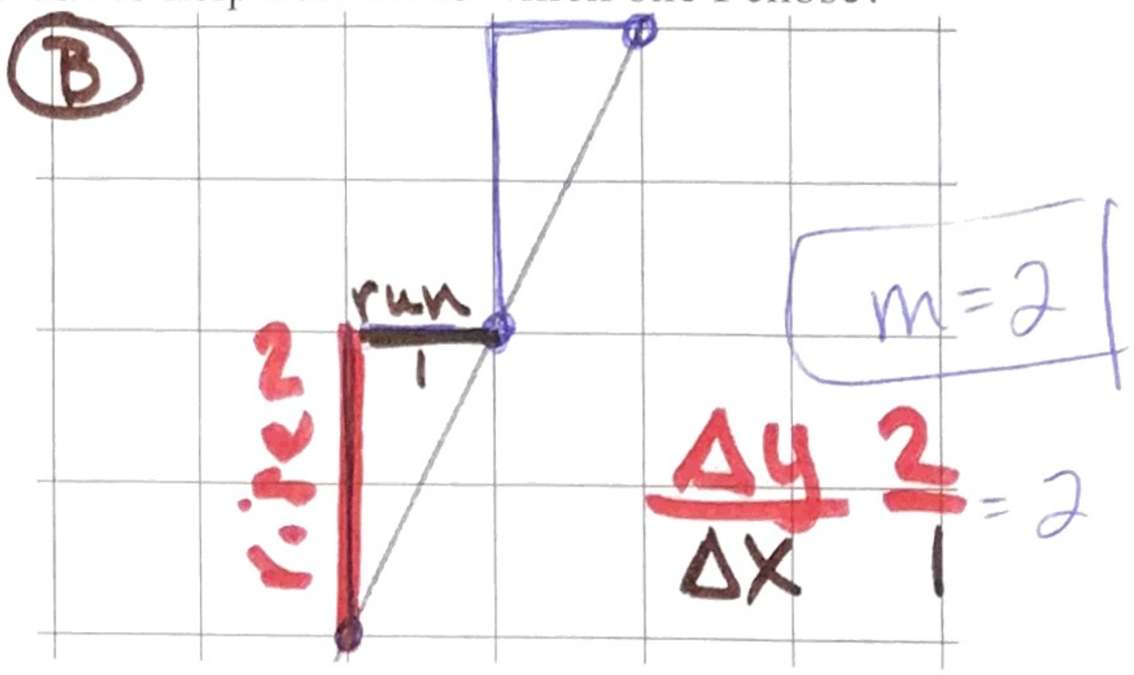
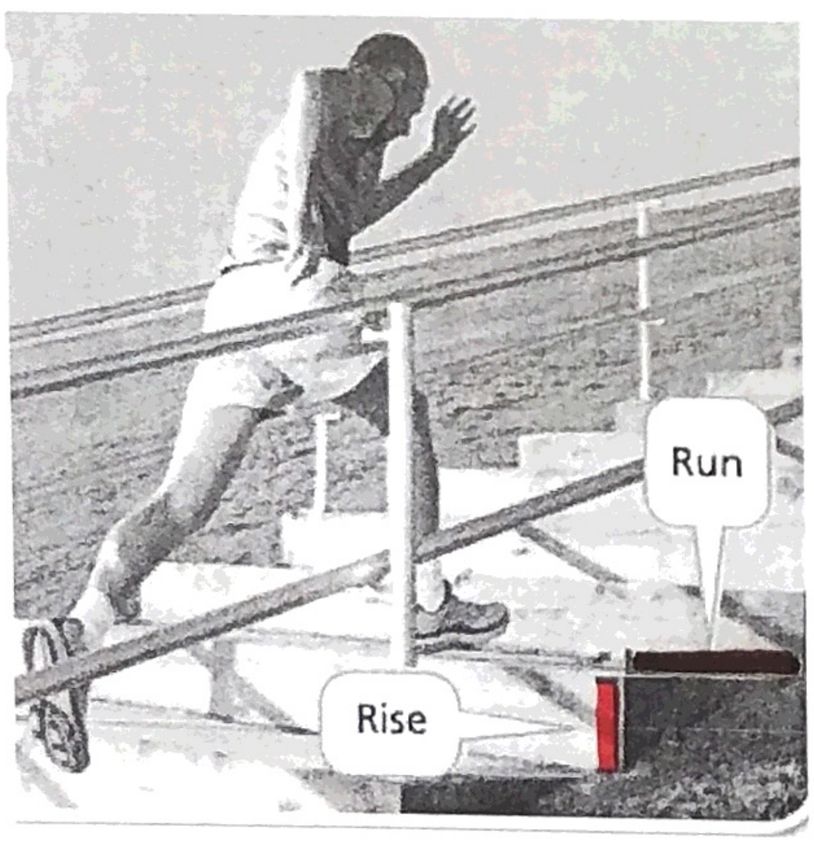
A. If I secretly chose a line, what question could you ask to help determine which one I chose?





I'd ask Steep, horiz., vertical, cross x-axis, corner, every square

B. Yesterday we developed the ratio we would use when finding a rate of change. The ratio was change in the Dep. variable to the change in the Indep. variable. Mathematicians use a different word for rate of change; they call it Slope and use the letter m. When using a graph, many people use a carpentry reference to help them remember what they are doing. The parts of stairs have been labeled below in carpentry terms.



1. Which direction does "rise" go? vertical
2. Which axis goes this direction? y
3. Which direction does "run" go? horizontal
4. Which axis goes this direction? x
5. For each line above, draw a stair and label a rise and a run.

6. Fill in the blanks to explain why slope from a graph is commonly called rise over run.

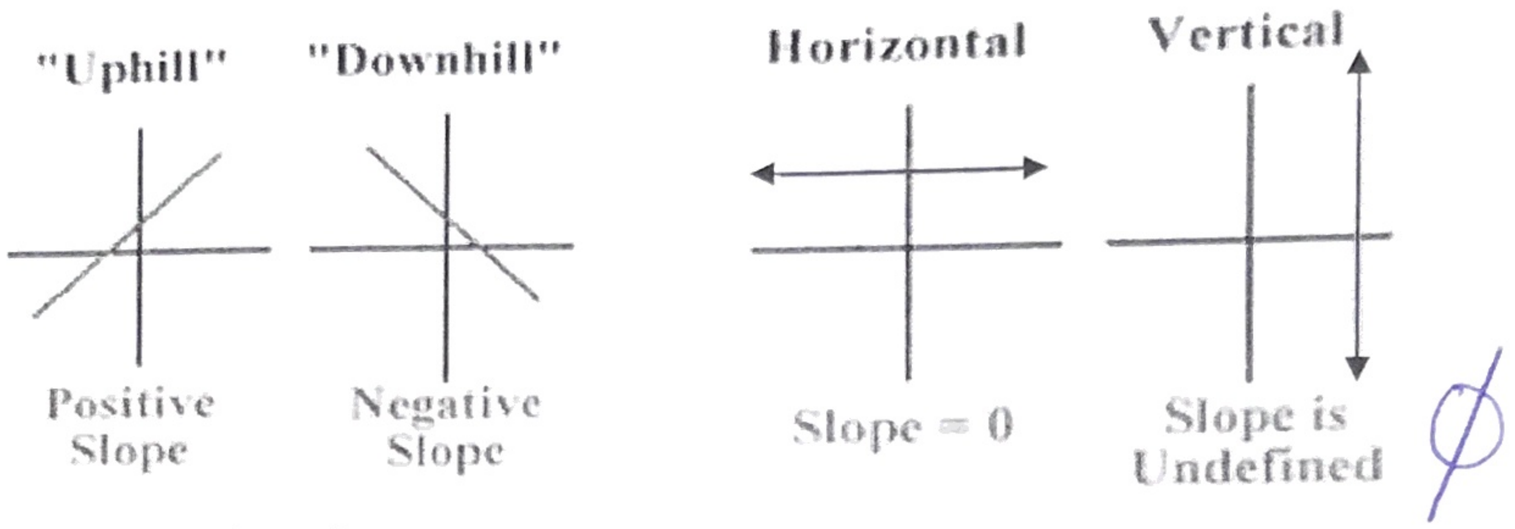
Slope m = Rate of Change = $\frac{\text{Change in D.V.}}{\text{Change in I.V.}} = \frac{\text{Change in y values}}{\text{Change in x values}} = \frac{\text{vertical Change}}{\text{horiz. Change}} = \frac{\text{Rise}}{\text{Run}}$

While this is "cute" it only works for graphs. We really need to focus on $\frac{change\ in\ y\ values}{change\ in\ x\ values}$ and write it in symbols. The symbol for "change in" is Δ and is said using its Greek Letter name delta. So we will use the fraction $\frac{\Delta y}{\Delta x}$ for slope.

7. ~~8~~. For each line above find the ratio of the rise to the run. How does this help you determine which is steeper?

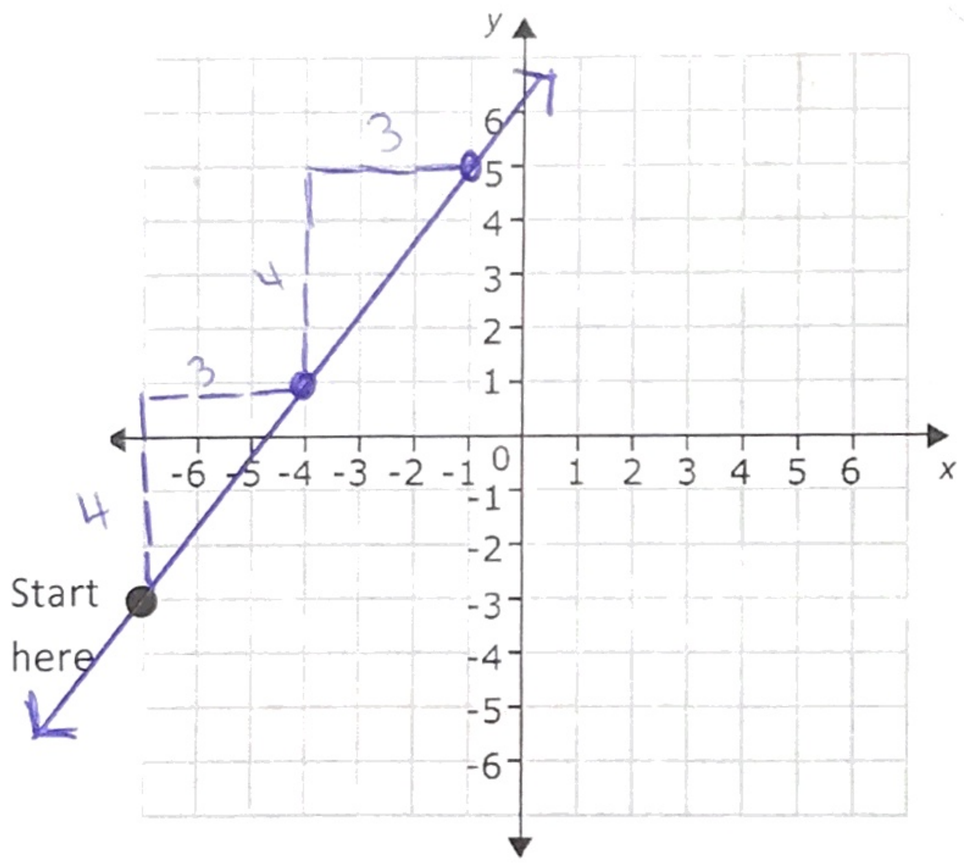
2 > 1

C. Drawing Slopes
Slopes come in 4 types:

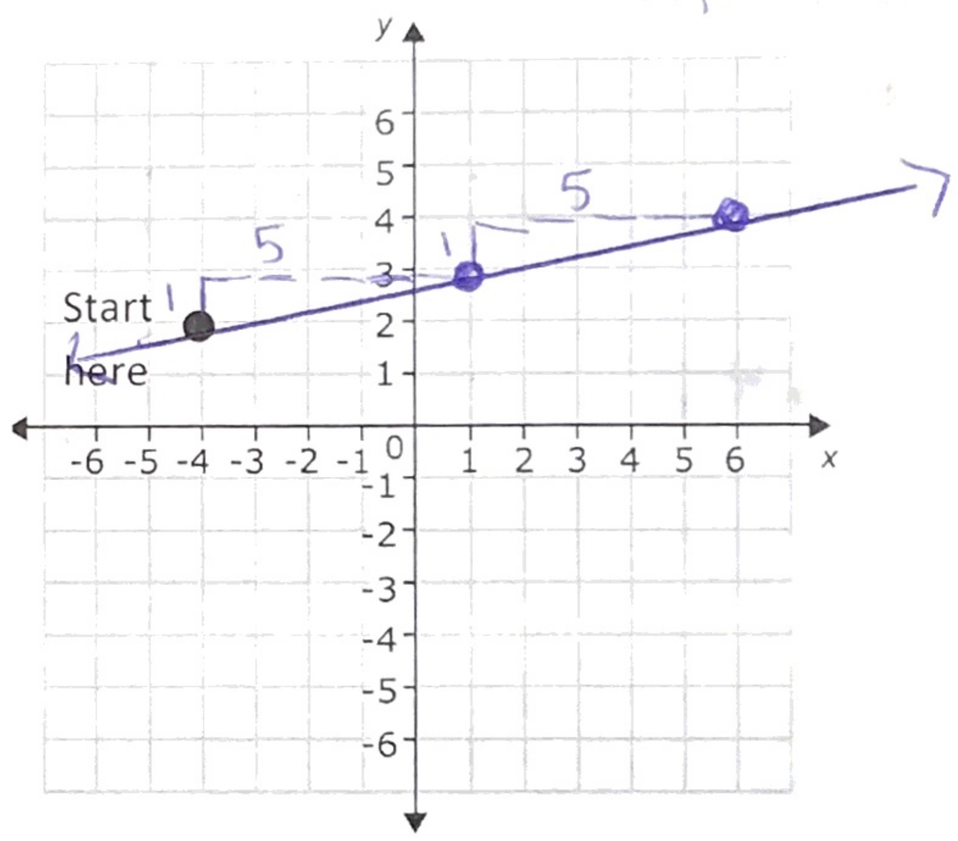


All lines have a slope. You can NOT say "no slope."
The last two are easy, but we have not yet drawn the first two.

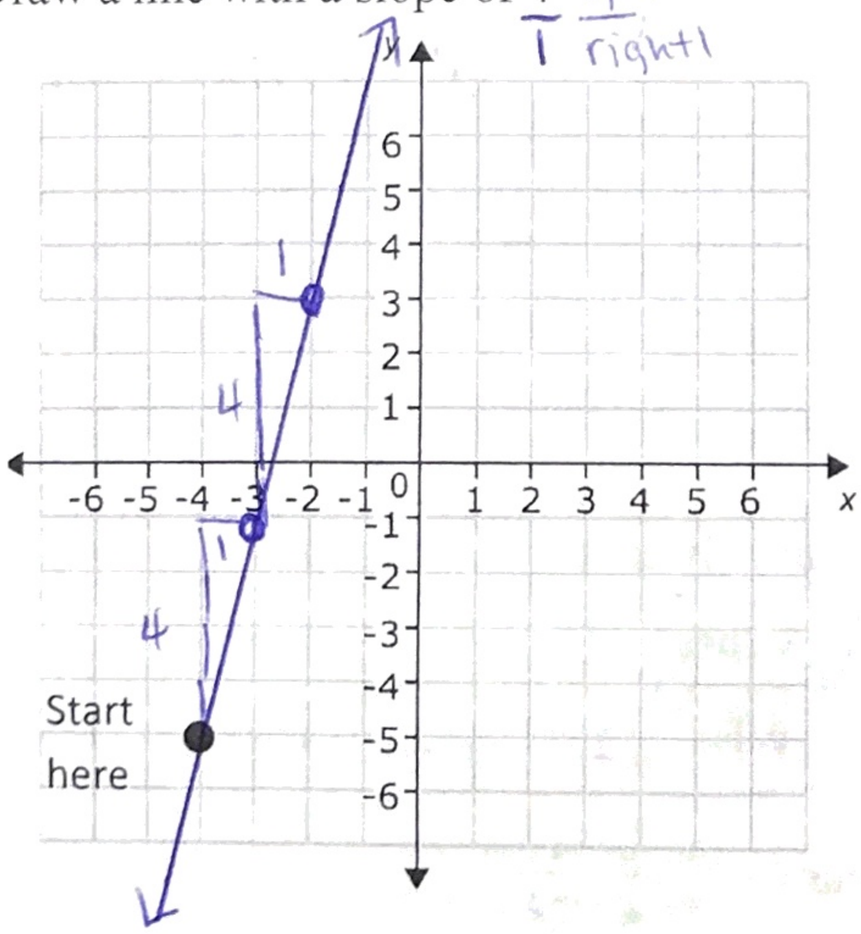
1. Draw a line with a rate of change of $\frac{4}{3}$ $\frac{\text{rise } 4}{\text{run right}}$



2. Draw a line with a slope of $\frac{1}{5}$ $\frac{\text{up } 1}{\text{right}}$



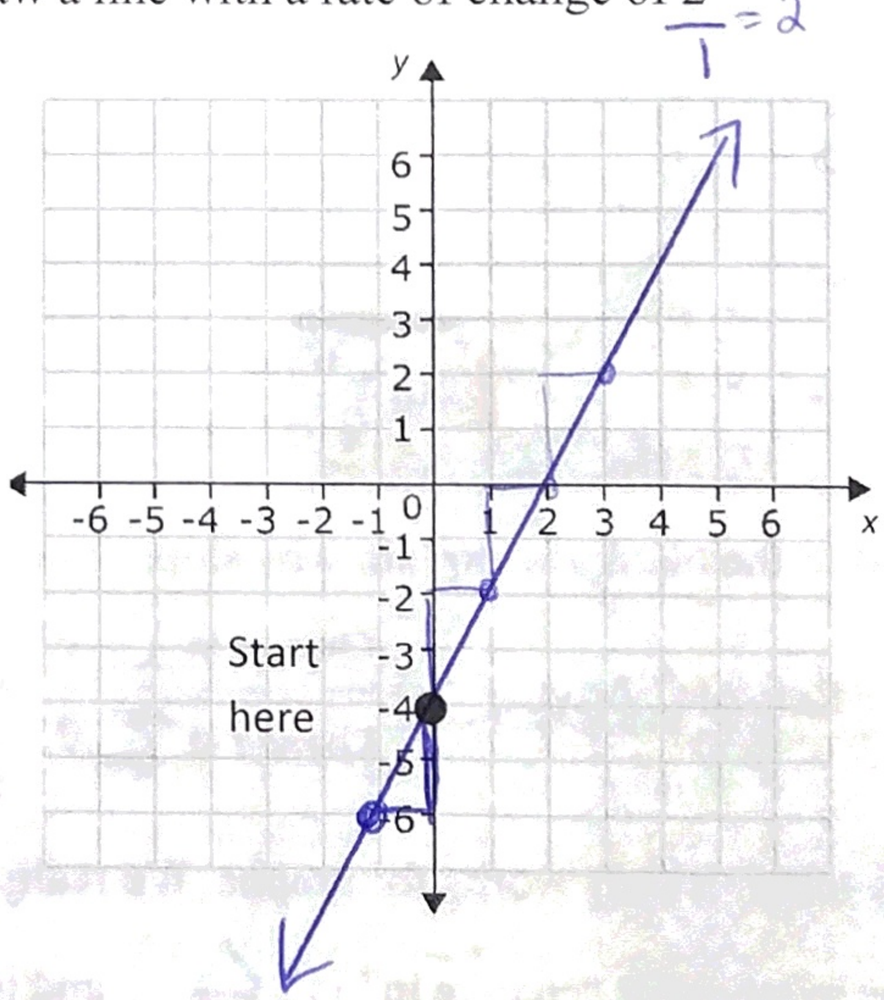
3. Draw a line with a slope of $\frac{4}{1}$ $\frac{\text{up } 4}{\text{right } 1}$



4. Draw a line with a rate of change of $\frac{2}{1}$

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

down 2
left 1



slope $\frac{1}{5}$, $\frac{4}{3}$, 2, 4

Graph (2) (1) (4) (3)

D. Drawing Lines with Negative Slopes using Stairs

1. Which of the following equations are true

ocus

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

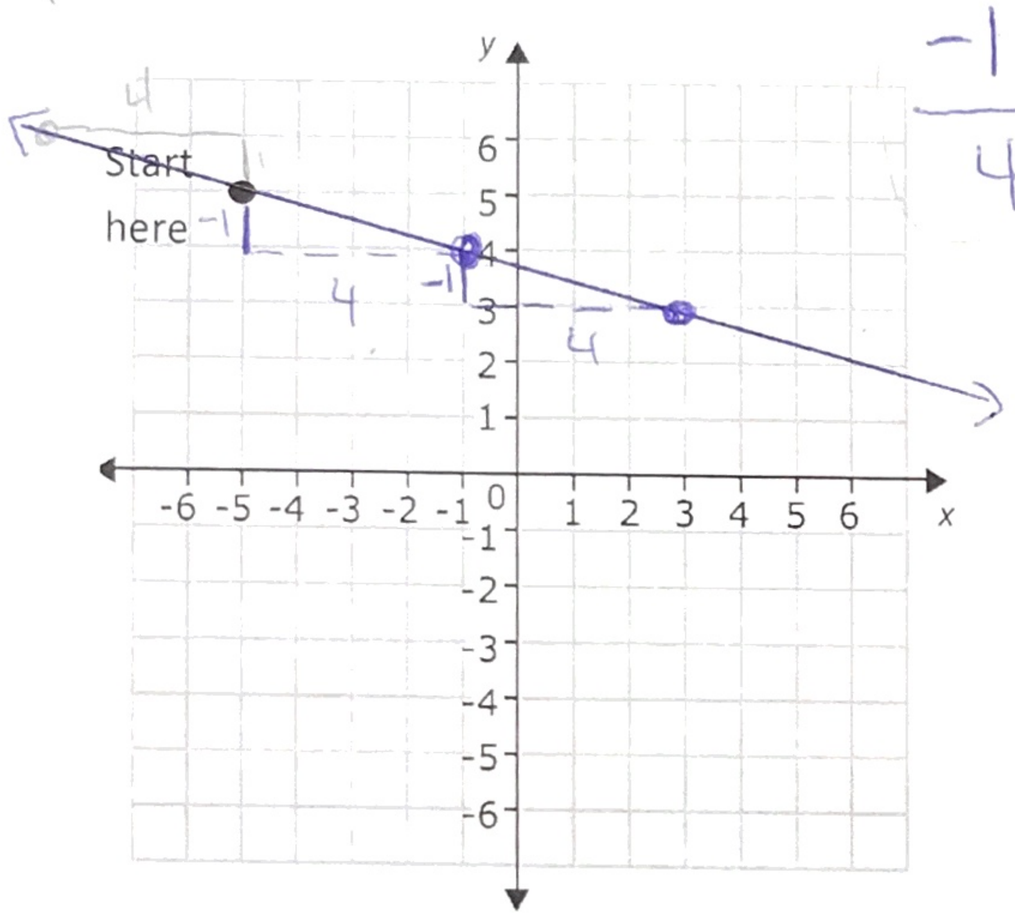
-1.5 -1.5 -1.5 -1.5 -1.5 1.5

2. So when a slope is negative you can put the negative with either the numerator or the denominator, but NOT BOTH. Because we usually run right (which is the positive direction), it is **most common to put the negative with the** numerator **and move** down.

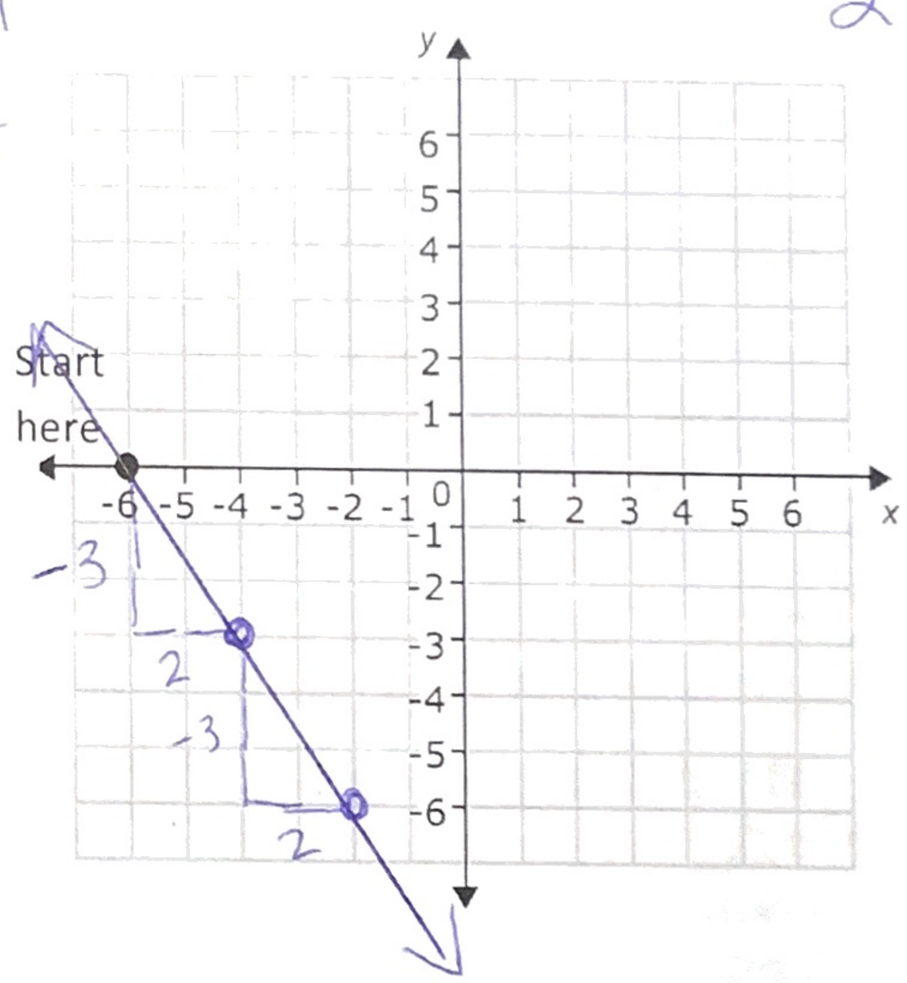
or $\frac{1 \text{ up}}{-4 \text{ left}}$

3. Draw a line with a rate of change of $-\frac{1}{4}$

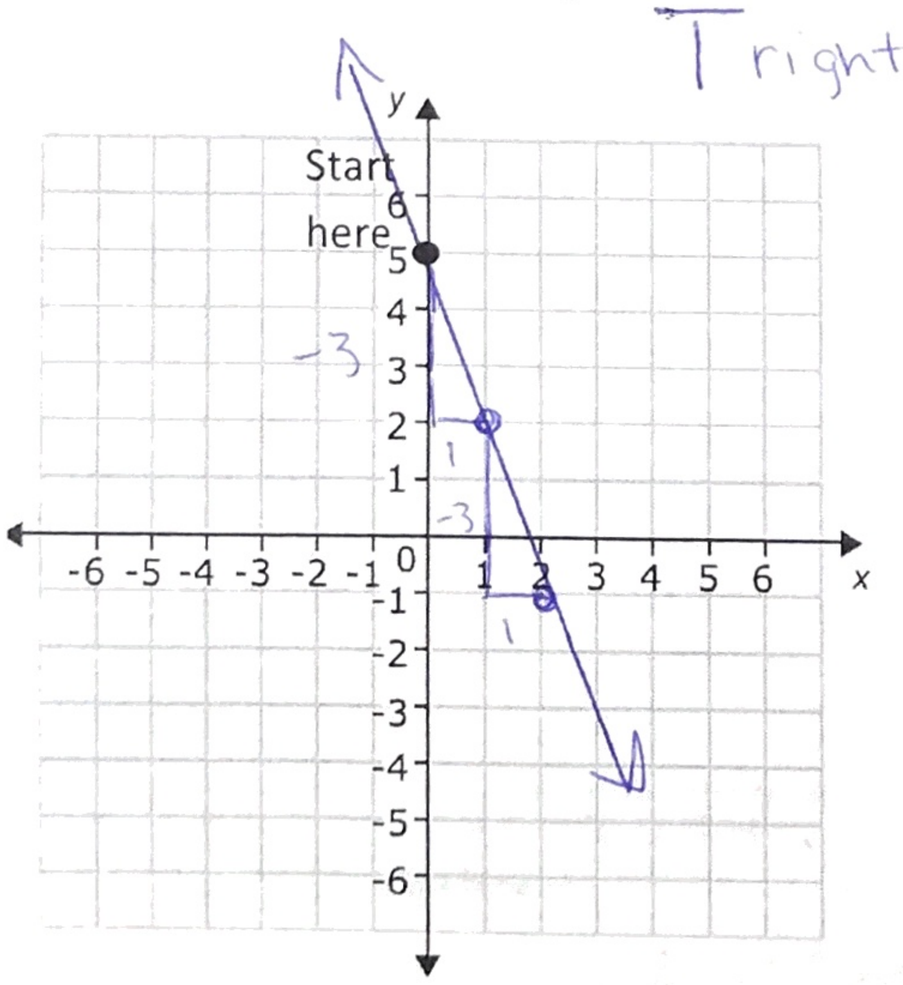
$\frac{-1 \text{ down } 1}{4 \text{ right}}$



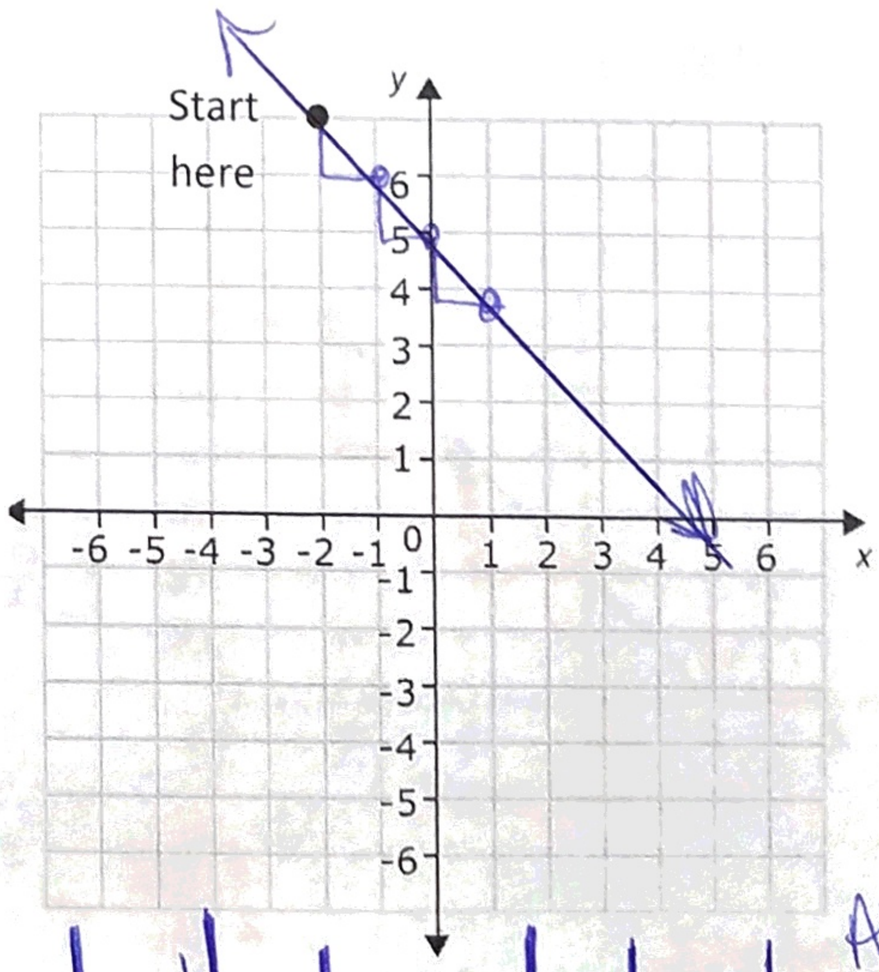
5. Draw a line with a slope of $-\frac{3}{2}$ $\Rightarrow \frac{-3}{2}$ $\frac{\text{down}}{\text{right}}$



6. Draw a line with a slope of -3 $\frac{\text{down } 3}{1 \text{ right}}$



7. Draw a line with a rate of change of -1



Least to Greatest slope: $|-\frac{1}{4}|$, $|-1|$, $|-3/2|$, $|-3|$ Absolute value (distance from zero)

Graph #: (3), (7), (5), (6)