

# Chapter 6: Linear Functions

[http://www.youtube.com/watch?v=tMhF-1ew\\_bM&feature=related](http://www.youtube.com/watch?v=tMhF-1ew_bM&feature=related)



1



2

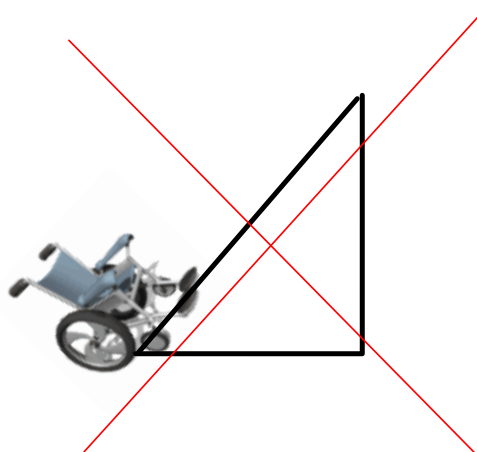
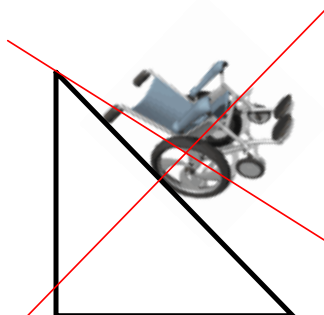


3



7

A wheelchair ramp should not exceed a slope of 0.125.



8



Building stairs  
should  
not exceed  
a slope of  
0.83

6



10

# Calculating slope!

Same as rate of change

See a graph

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$





Some roofs are steeper than others. Steeper roofs are more expensive to shingle. The steepness of a roof is measured by calculating its **slope**.

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

The **rise** is the vertical distance from the bottom of the edge of the roof to the top.

The **run** is the corresponding horizontal distance.

For each roof, we count units to determine the rise and the run.

Roof A



For Roof A

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

$$\text{Slope} = ?$$

y intercept - Slope

$$y = mx + b$$

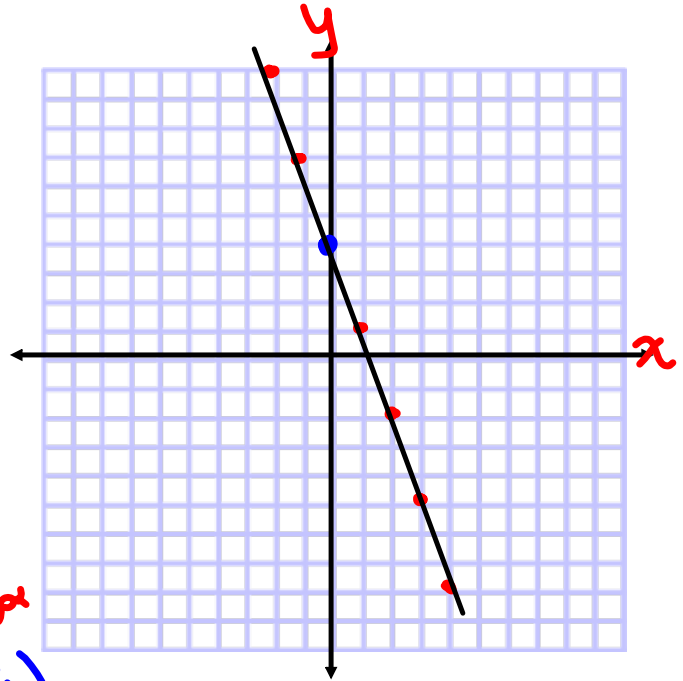
↑ slope      ↑ y-intercept

Ex)  $y = -3x + 4$

$m = -3$  slope

y-intercept =  $+4$   
 $(0, 4)$  point

Sketch using these  
two pieces of  
information



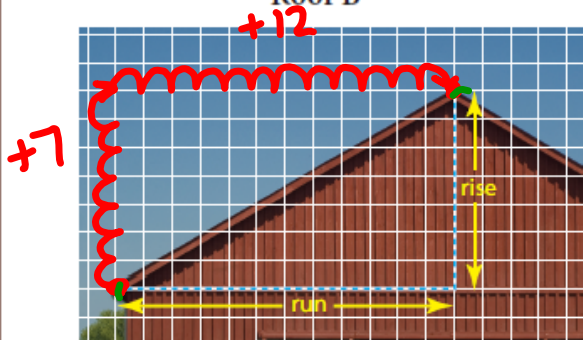
Step 1] Place the y-intercept  
on the graph (blue  
 $(0, 4)$  dot)

Step 2] Use  $m = -3$  to  
get new points.

$$m = \frac{-3}{1} \text{ or } \frac{3}{-1} \frac{\text{rise}}{\text{run}}$$

Use  $\frac{\text{rise}}{\text{run}}$  to get new points  
from y-intercept

Roof B

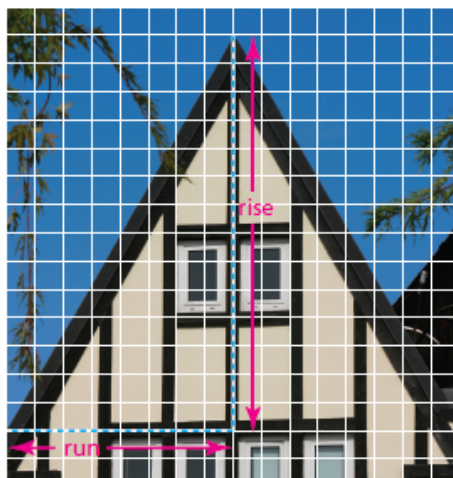


For Roof B

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

$$\text{Slope} = ? \frac{+7}{+12}$$

Roof C



For Roof C

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

$$\text{Slope} = ?$$

The slope of a line segment on a coordinate grid is the measure of its rate of change.  
From Chapter 5, recall that:

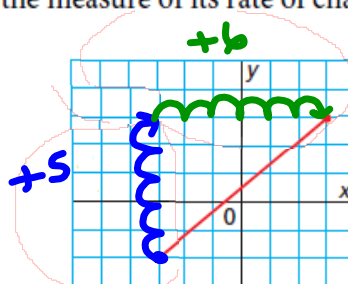
$$\text{Rate of change} = \frac{\text{change in dependent variable}}{\text{change in independent variable}}$$

$$\text{Rate of change} = \frac{\text{change in } y}{\text{change in } x}$$

The change in  $y$  is  $\Delta y$

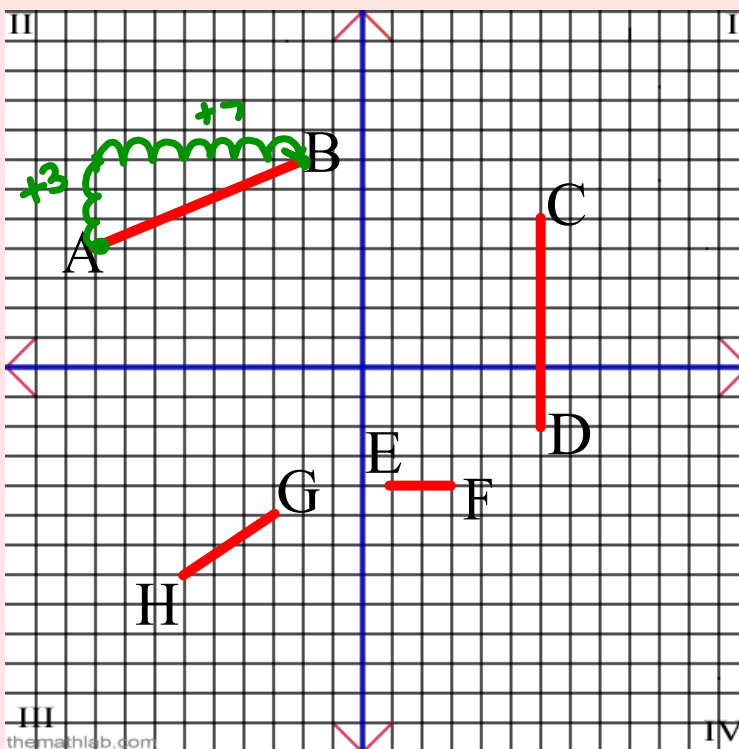
The change in  $x$  is  $\Delta x$

$$\text{So, slope} = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$$



$$m = \frac{\text{rise}}{\text{run}} = \frac{+5}{+6} = \frac{5}{6}$$

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slope =  $\frac{\text{rise}}{\text{run}}$

This is used  
when you  
can see the  
graph!



$$m_{AB} = \frac{\text{rise}}{\text{run}} = \frac{3}{7}$$

$$m_{HG} = \frac{2}{3}$$

horizontal  $\rightarrow m_{EF} = \frac{0}{2} = 0$

vertical  $\rightarrow m_{CD} = \frac{7}{0} = \text{undefined}$

# Calculating slope!

2 points given  
 $(x_1, y_1)$ ,  $(x_2, y_2)$

$$m = \frac{\Delta y}{\Delta x}$$

slope

Study

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

Find the slope of a line passing through the points (2,-3) and (-5,8).

Point 1	Point 2
(2, -3)	(-5, 8)
$x_1$ $y_1$	$x_2$ $y_2$

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

$$= \frac{8 - (-3)}{-5 - 2}$$

watch sign

$$= \frac{8 + 3}{-5 - 2}$$

$$m = \frac{11}{-7}$$

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

This is used when you are given co-ordinates.

## YOU TRY

Find the slope of a line passing through the points (7,5) and (8,-2).

$$\begin{array}{cc} (7,5) & (8,-2) \\ x_1 y_1 & x_2 y_2 \end{array}$$

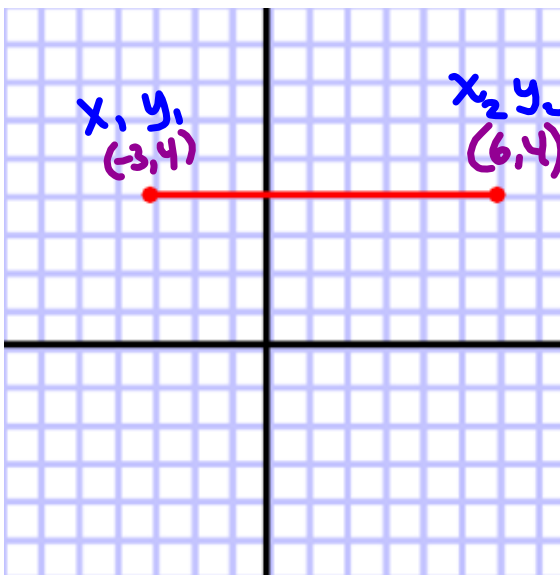
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-2 - 5}{8 - 7} = \frac{-7}{1}$$



# Horizontal Line

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



Pick two points

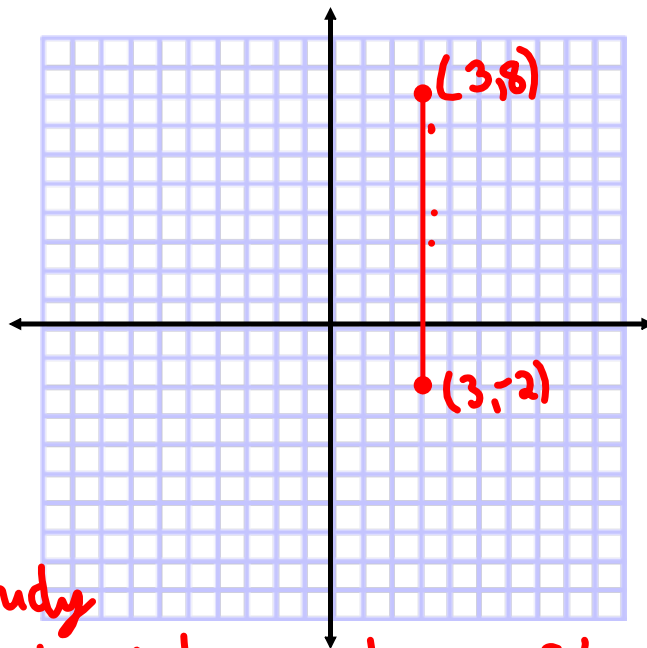
$$m = \frac{4 - 4}{6 - (-3)} = \frac{0}{6 + 3} = \frac{0}{9} = 0$$

Study

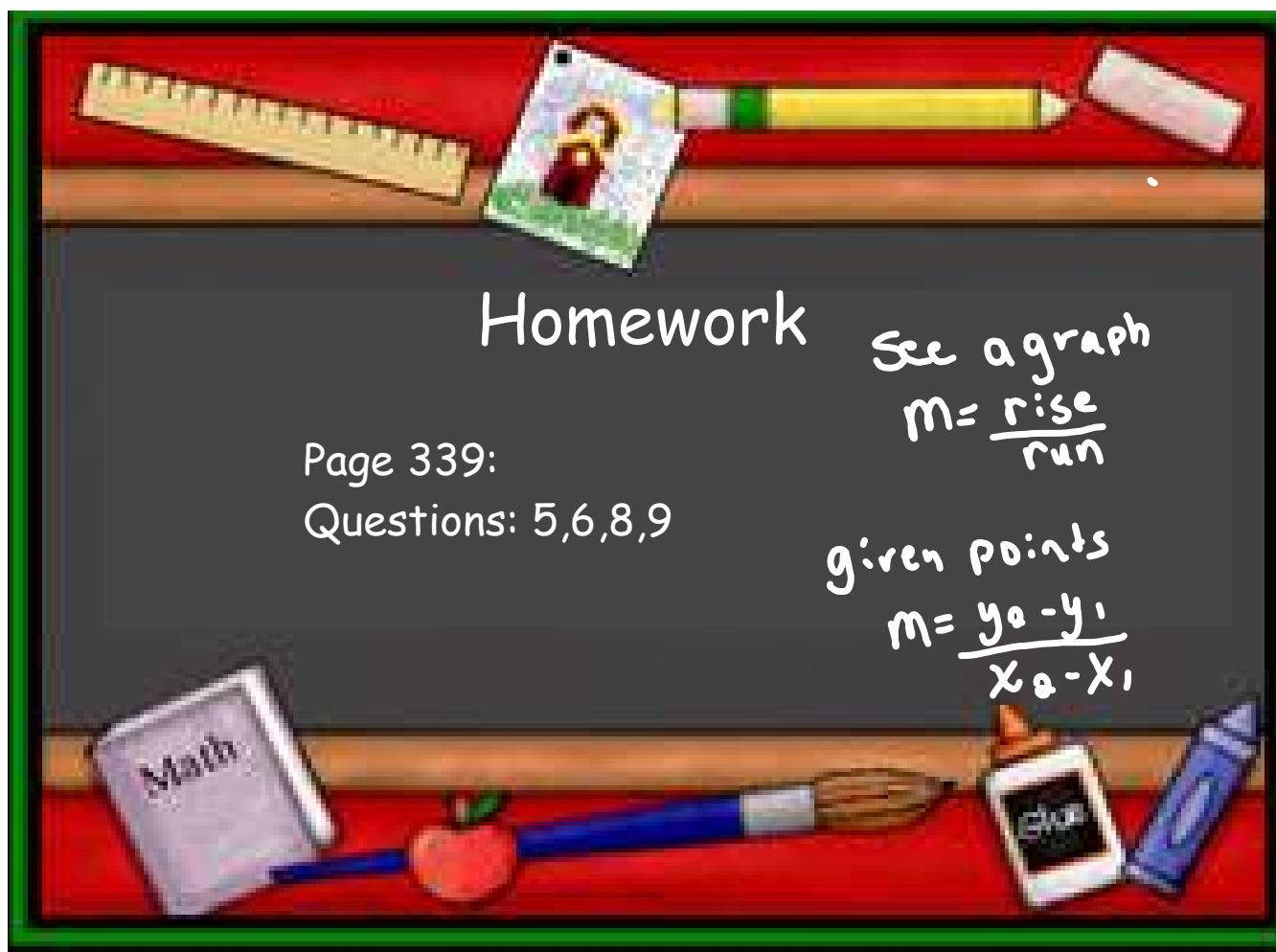
Horizontal lines have a slope of zero

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

$$\frac{8 - (-2)}{3 - 3} = \frac{8 + 2}{0} = \frac{10}{0} \text{ Undefined}$$



Study  
Vertical lines have slope that are  
undefined



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Calculate the slope.

1.  $(3,5) (2,8)$

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

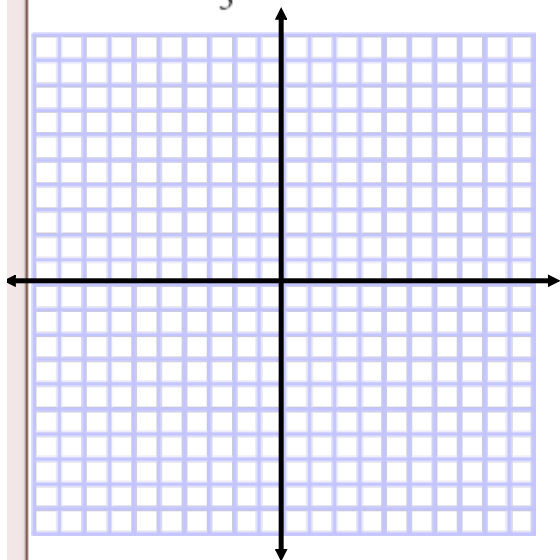
2.  $(-9,-2) (7,3)$

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

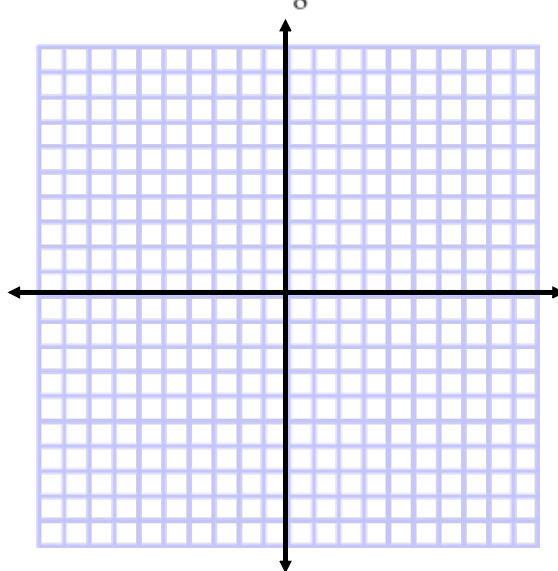
**Example 2** Drawing a Line Segment with a Given Slope

Draw a line segment with each given slope.

a)  $\frac{7}{5}$



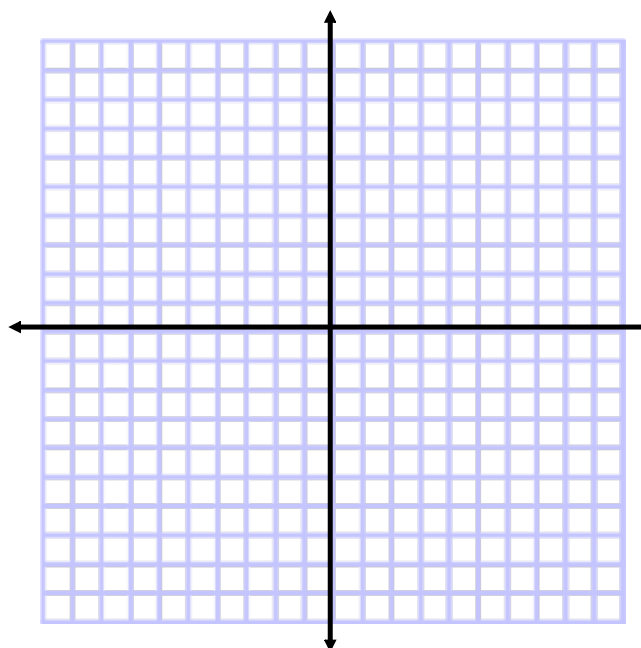
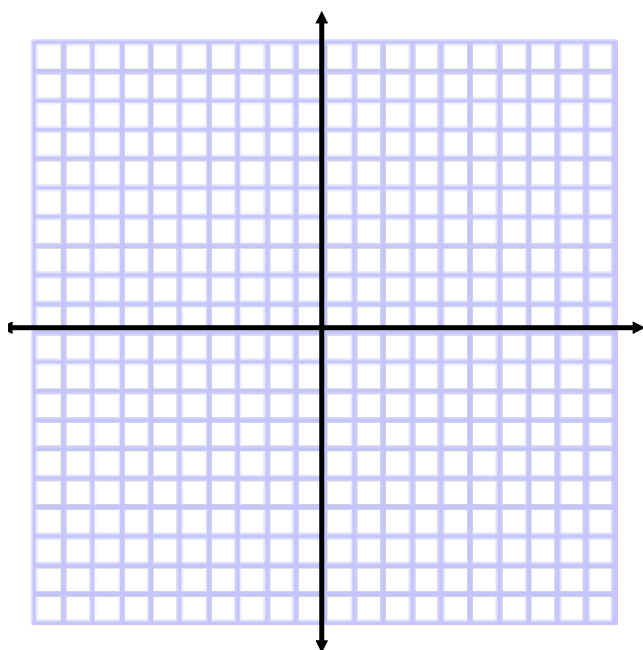
b)  $-\frac{3}{8}$



2. Draw a line segment with each slope.

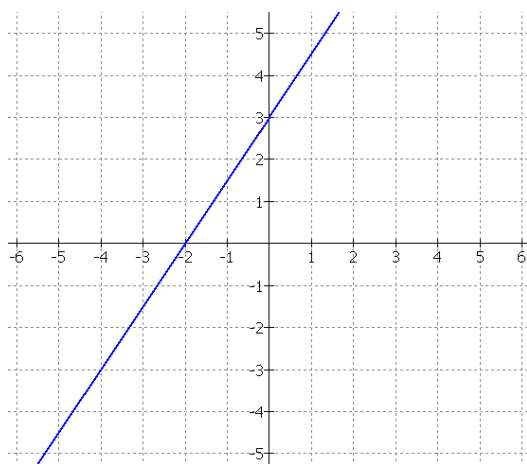
a)  $\frac{4}{9}$

b)  $-\frac{8}{3}$

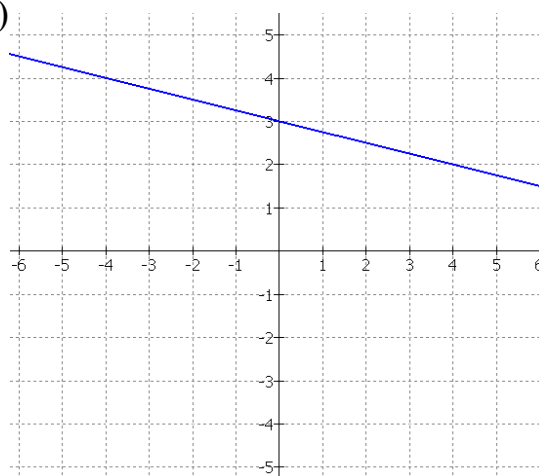


Determine the slope of each of the following lines:

(a)



(b)



Which ordered pairs should we use to make our calculation?

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

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

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

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