Chapter 6: Linear Functions

BUILDING ON

Graphing linear relations
Recognizing the properties of linear relations
Solving linear equations

BIG IDEAS

The graph of a linear function is a non-vertical straight line with a constant slope
Certain forms of the equation of a linear function identify the slope and y-intercept of the graph or the slope and the coordinate of a point on the graph

New Vocabulary

Slope
Rise
Run
Negative reciprocals
Slope-intercept form
Slope-point form
General form

6.1 Slope of a Line

Lesson Focus

Determine the slope of a line segment and a line

Reminder

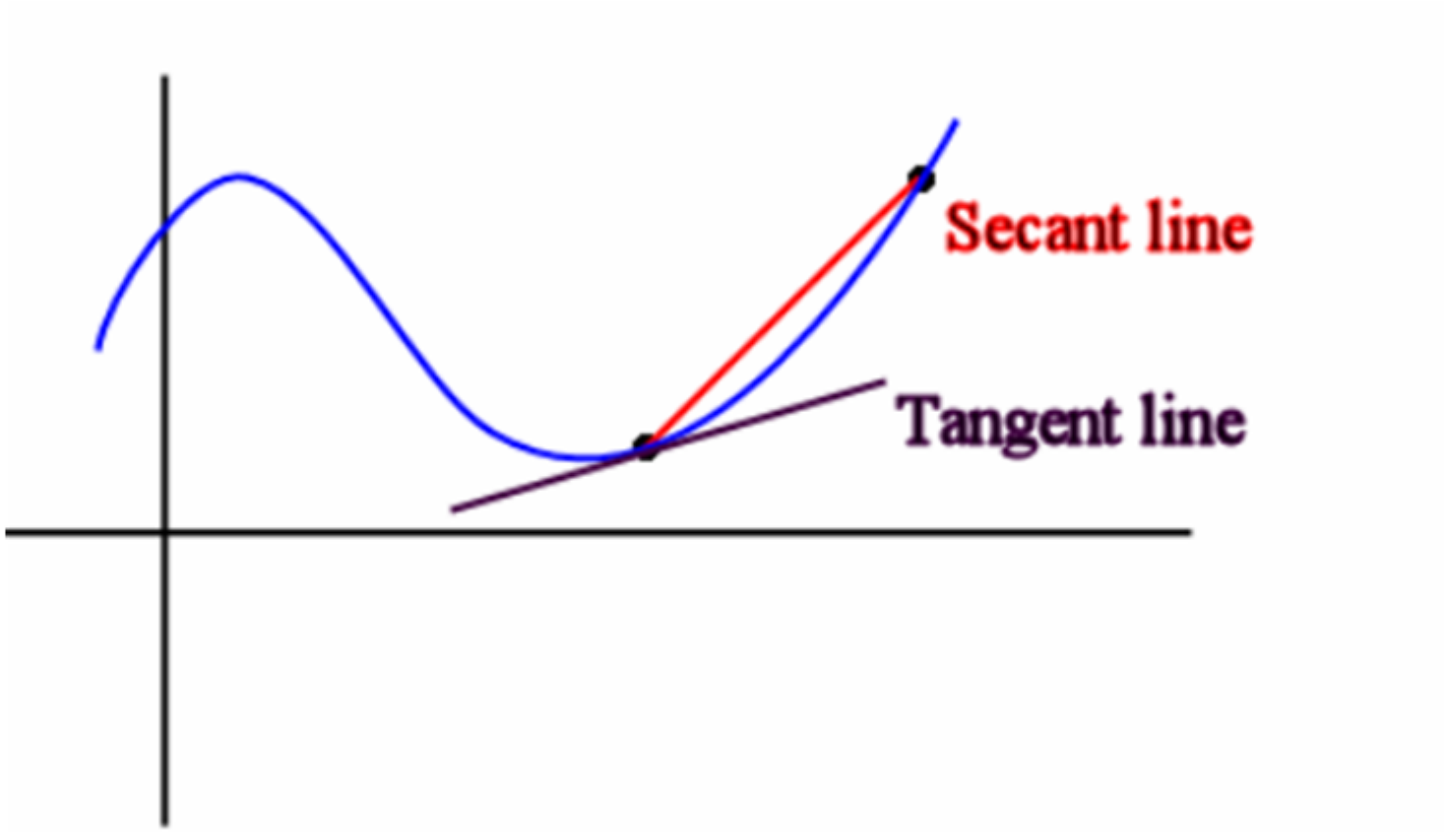
- For a linear relation we can calculate the **rate of change**

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

- *This is commonly referred to as the* ***slope***

$$slope = \frac{rise}{run} \quad or \quad slope = \frac{y_2 - y_1}{x_2 - x_1}$$

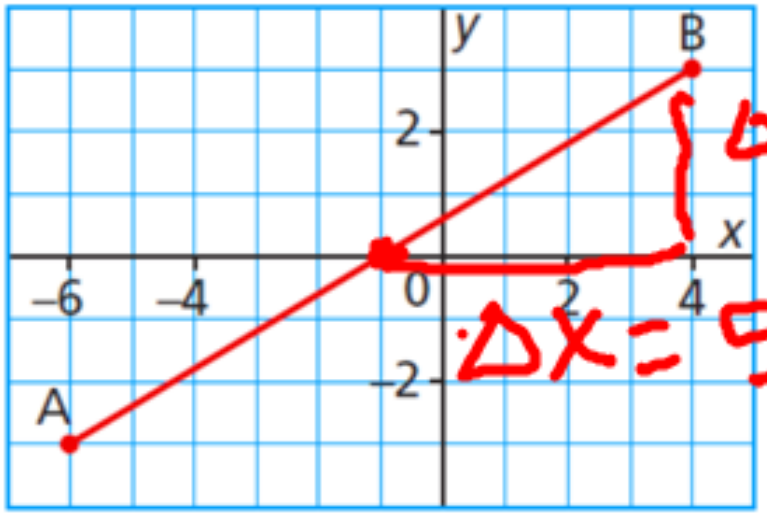
Calculus Preview



Example

Determine the slope of each line segment.

a)

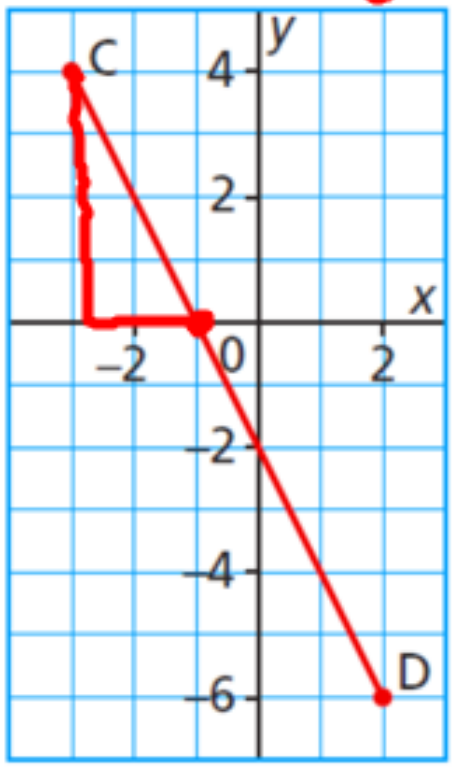


$\Delta y = 3$

$\Delta x = 5$

$m = \frac{3}{5}$

b)



$\Delta y = \frac{-4}{2}$

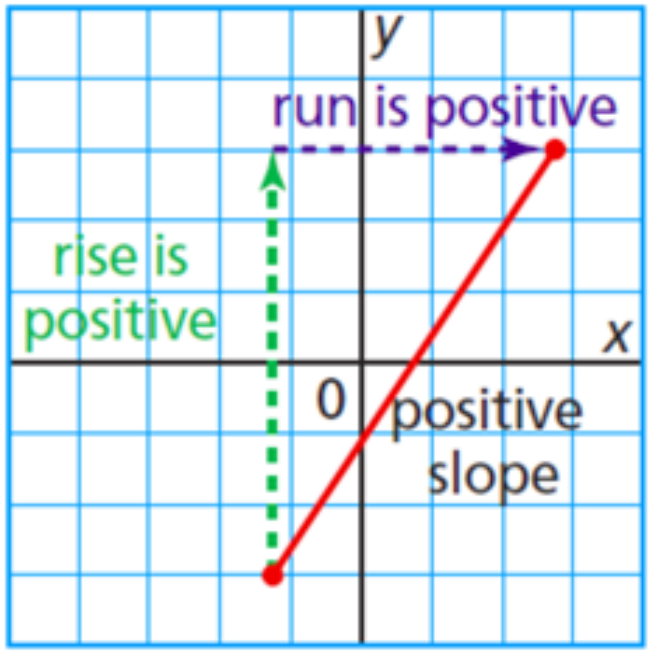
$= -2$

*What's the difference between **line segment** and **line**?*

Positive vs. Negative Slope

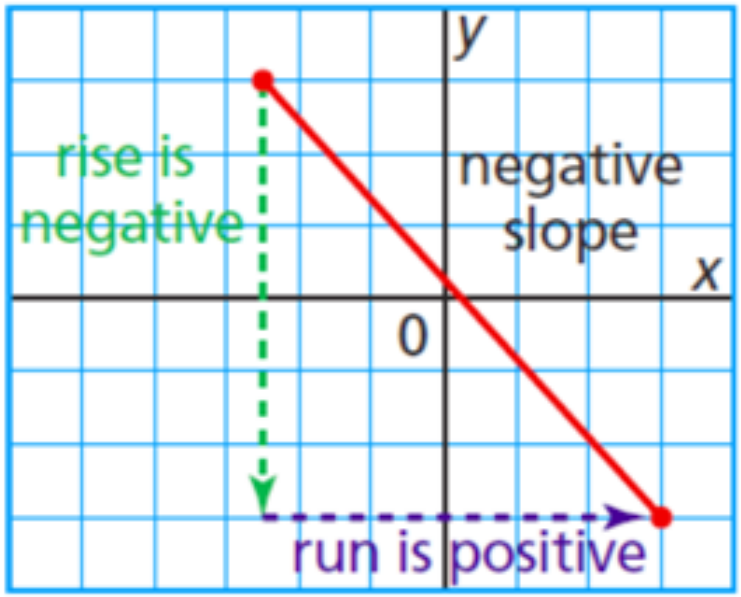
Positive Slope

As the x value gets bigger
(increasing from left to right)
The y value gets bigger
(increasing upwards)



Negative Slope

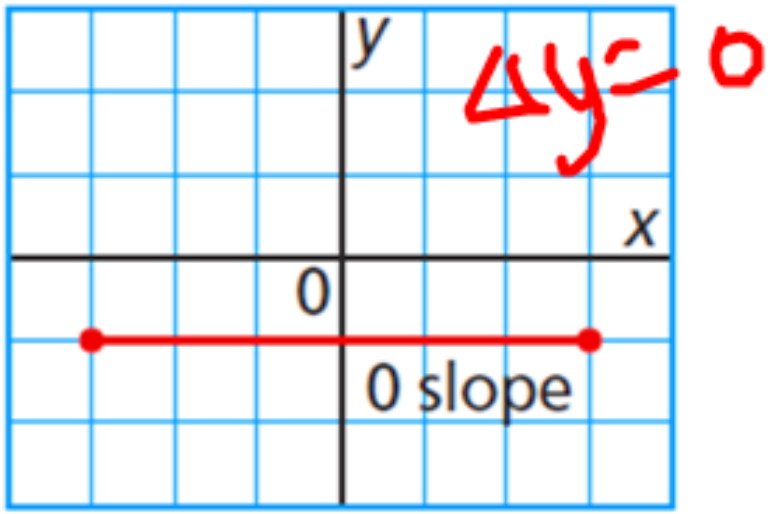
As the x value gets bigger
(increasing from left to right)
The y value gets smaller
(decreasing downwards)



Zero vs. Undefined Slope

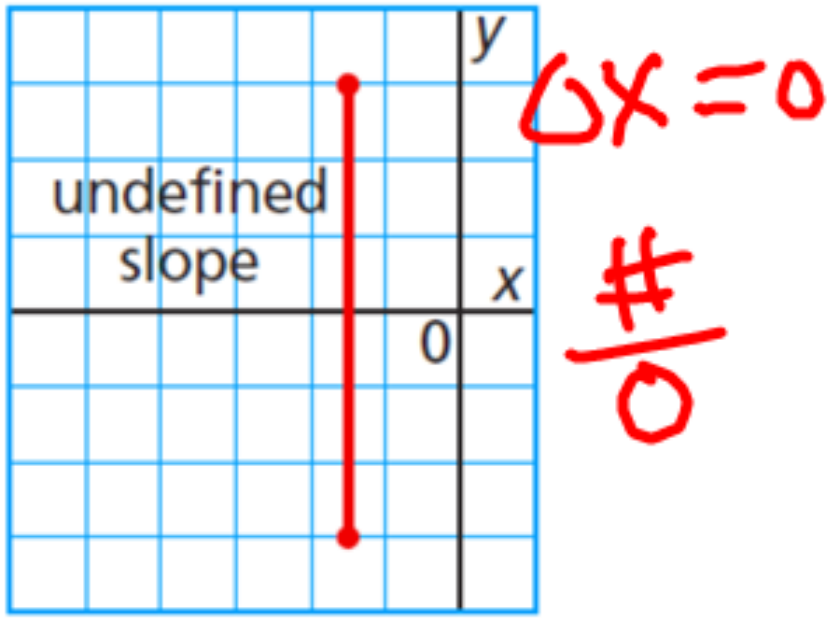
Zero Slope

As the x value increases
The y value doesn't change (no rise)



Undefined Slope

The x-value doesn't change (no run)
The y-value increases

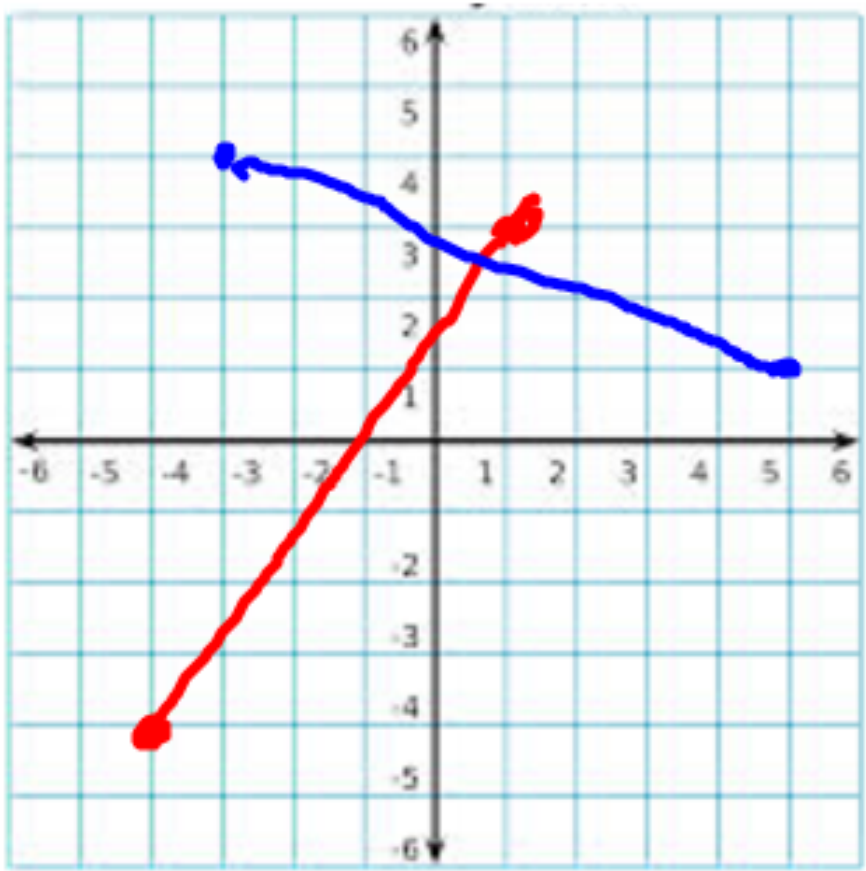


Example

Draw a line segment with each given slope.

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

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

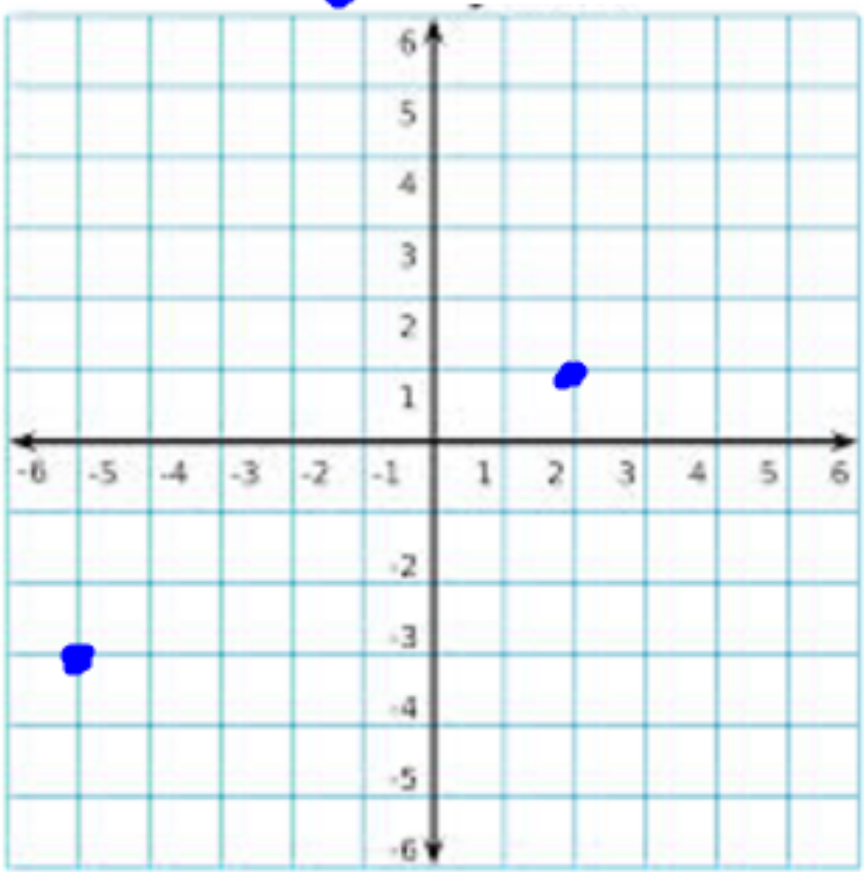


Example

Determine the slope of the line that passes through C(−5, −3) and D(2, 1).

x_1 y_1

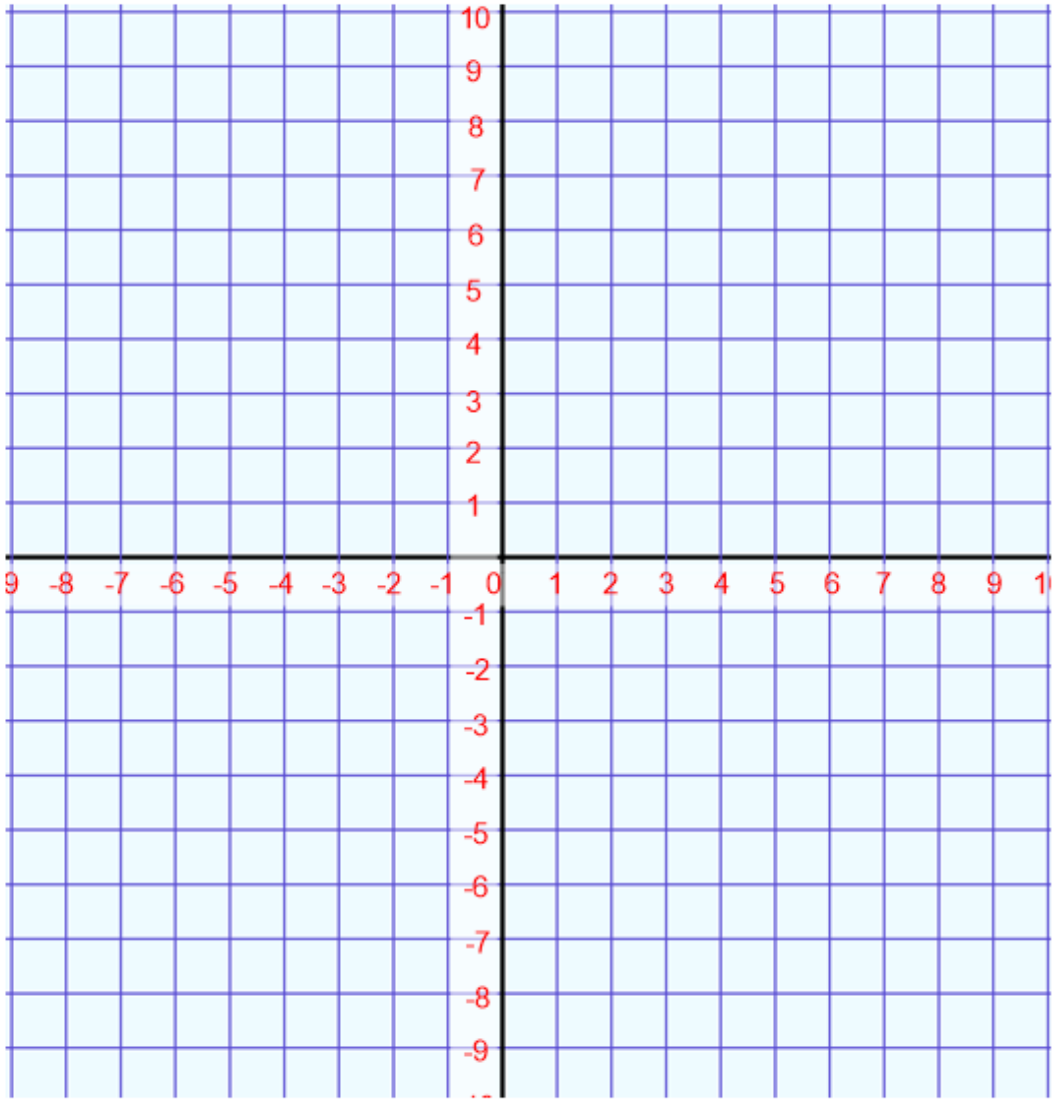
x_2 y_2



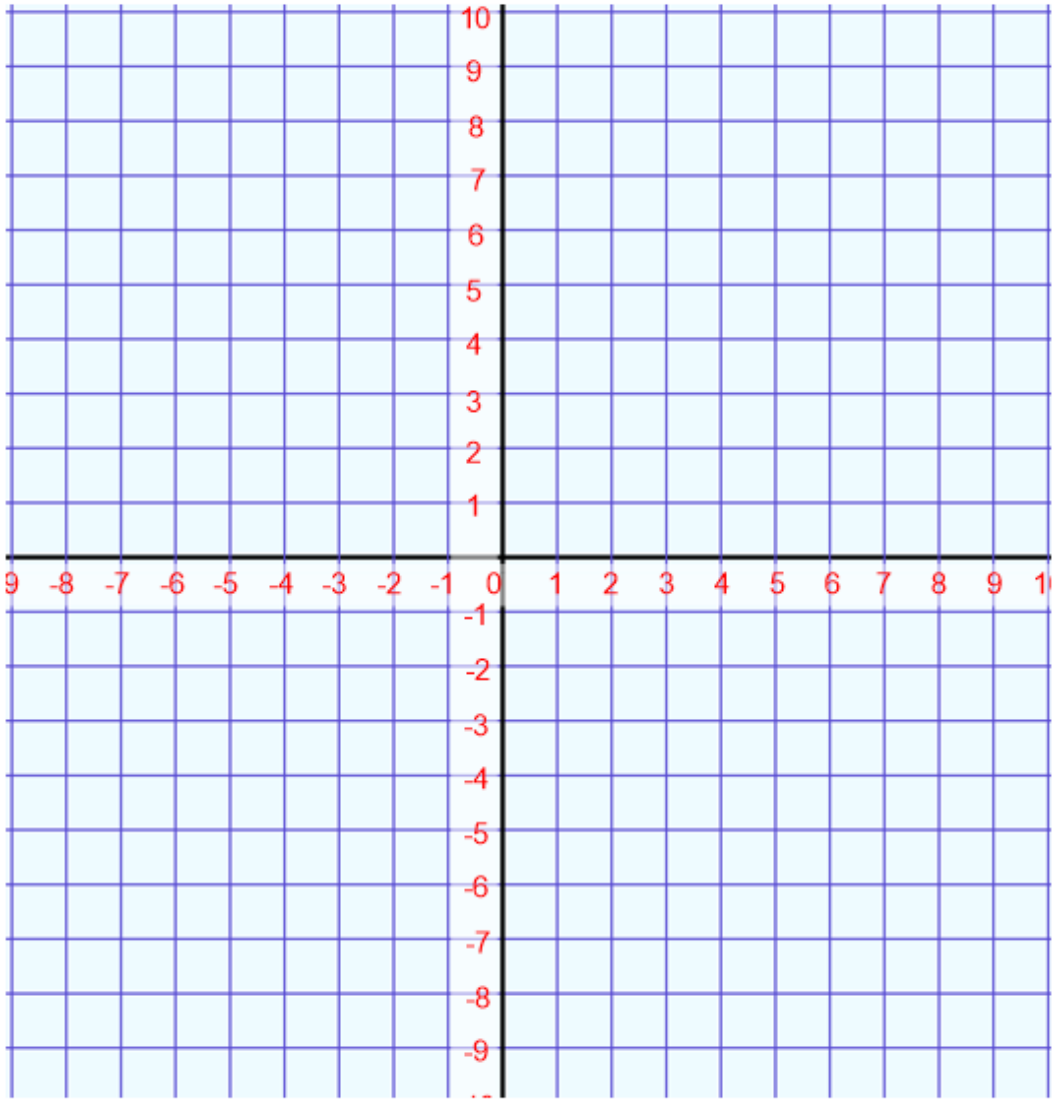
$$slope = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{1-(-3)}{2-(-5)} = \frac{4}{7}$$

Distance Formula Application



Find the dsitance between the points (-7,3) and (5,-8)



Find the slope of the linear functions below:

a) $y = 4x + 7$

$m = 4$

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

$\frac{2}{2} \quad \frac{2}{2} \quad \frac{2}{2}$

$y = -\frac{3}{2}x + \frac{5}{2}$

$m = -3/2$

$m = 4/5$

c) $5y - 4x + 9 = 0$

$\frac{5y}{5} = \frac{4x}{5} - \frac{9}{5}$

$y = \frac{4}{5}x - 9/5$

$m = \frac{8}{9}$

d) $\left(\frac{3}{4}y - \frac{2}{3}x + 3 = 0\right)12$

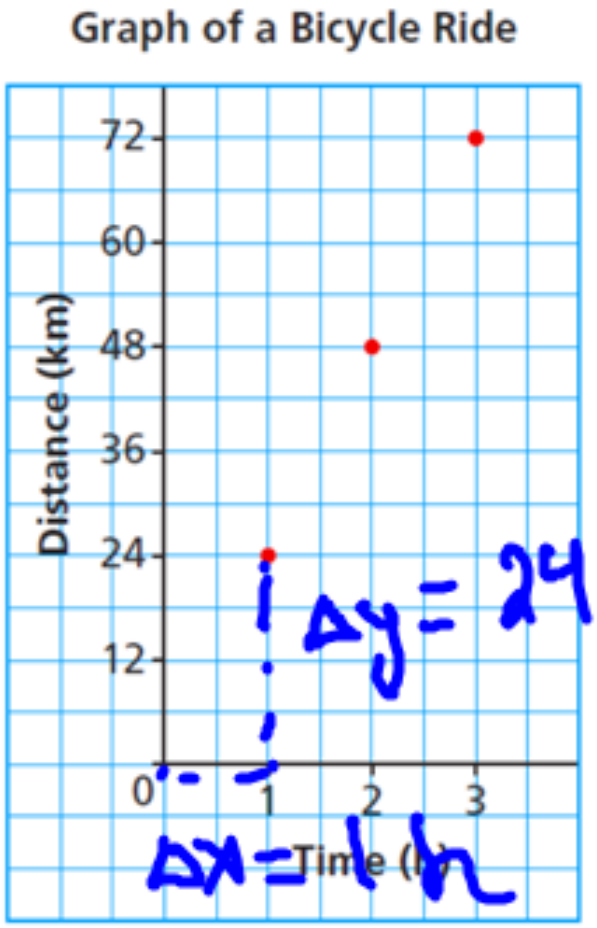
$9y - 8x + 36 = 0$

$\frac{9y}{9} = \frac{8x}{9} - \frac{36}{9}$

$y = \frac{8}{9}x - 4$

Example

Yvonne recorded the distances she had travelled at certain times since she began her cycling trip along the Trans Canada Trail in Manitoba, from North Winnipeg to Grand Beach. She plotted these data on a grid.



a) What is the slope of the line through these points?

b) What does the slope represent?

speed

c) How can the answer to part b be used to determine:

i) how far Yvonne travelled in $1\frac{3}{4}$ hours?

ii) the time it took Yvonne to travel 55 km?

$\Delta y = 24$ km

$\Delta x = 1$ h

$m = \frac{24 \text{ km}}{1 \text{ hr}}$

c) $D = 24t$

i) $D = 24(1.75)$

$D = 42 \text{ km}$

ii) $\frac{55}{24} = \frac{24t}{24}$

$2.29 \text{ h} = t$

Homework

- **P. 339-343**

  # 5, 6, 9, 11, 13, 17, 20, 26