Lesson 2.2: Slope and Rate of Change

Find the slope of the line passing through the given points. Then tell whether the line *rises, falls, is horizontal, or is vertical*.

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

1- (2, -4), (4, -1)

$x_1\ y_1\ x_2\ y_2$

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

rises

2- (3, 7), (3, 10)

$\frac{10-7}{3-3} = \frac{3}{0} =$ undefined

Vertical

3- (1, 19), (5, 5)

$\frac{5-19}{5-1} = \frac{-14}{4} = \boxed{\frac{-7}{2}}$

falls

4- (2, -7), (-5,-7)

$\frac{-7-(-7)}{-5-2} = \frac{0}{-7} = \boxed{0}$

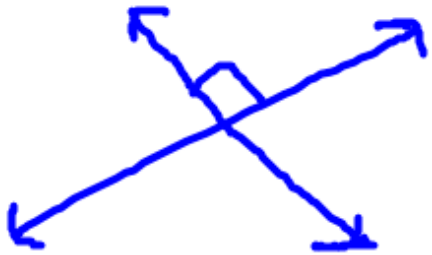
Horizontal

Perpendicular and Parallel Lines

Parallel: lines never touch

★ Slopes are the same ★

Perpendicular: cross at a 90° angle



Slopes are opposite and reciprocals of each other

Tell whether the lines are *parallel, perpendicular, or neither.*

Ex: Line 1: through (-6, 6) and (2, -6)
Line 2: through (1, -1) and (5, -7)

Line 1:

$$\frac{-6-6}{2-(-6)} = \frac{-12}{8} = \boxed{\frac{-3}{2}}$$

Line 2:

$$\frac{-7-(-1)}{5-1} = \frac{-6}{4} = \boxed{\frac{-3}{2}}$$

parallel

Tell whether the lines are *parallel, perpendicular, or neither.*

Ex: Line 1: through (3, 15) and (-1, -5)
Line 2: through (-1, 2) and (-4, 17)

Line 1

$m = \boxed{5}$

Line 2

$m = \frac{15}{-3} = \boxed{-5}$

neither.

Tell whether the lines are *parallel, perpendicular, or neither.*

Ex: Line 1: through (-1, 3) and (2, 9)
Line 2: through (-4, 5) and (2, 2)

$\frac{2}{1} \rightarrow \frac{1}{2}$

Line 1:

$m = \boxed{2}$

Line 2:

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

reciprocals ✓

opposites ✓

Perpendicular.

Find the average rate of change in y relative to x for the ordered pairs. Include units of measure in your answer.

(1, 8), (7, 20) x is measured in seconds and y is measured in meters

$x_1\ y_1\ x_2\ y_2$

$$\frac{20-8}{7-1}\ \frac{m}{s} = \frac{12}{6} = 2\ m/s$$

A road rises 195 feet over a horizontal distance of 3000 feet. What is the slope of the road?

$$m = \frac{\text{rise}}{\text{run}} = \frac{195}{3000} = \boxed{\frac{13}{200}}$$