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NOTES: Section 2.2 – Find Slope and Rate of Change

Goals: #1 - I can find the slope of the line passing through 2 points and compare slopes to determine which line is steeper.

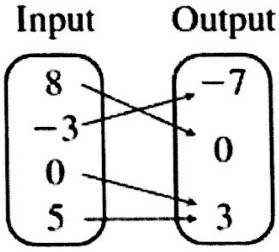
#2 - I can use slopes to determine if lines are parallel, perpendicular, or neither.



Homework: Lesson 2.2 Worksheet

Warm Up:

1. Identify the domain and range of the given relation. Then tell whether the relation is a function.



Domain: $\{8, -3, 0, 5\}$

Range: $\{-7, 0, 3\}$

Function?: Yes

2. Tell whether the function $f(x) = -x^2 + 3$ is linear. Then evaluate the function for $x = -2$. NO

$$f(-2) = -(-2)^2 + 3$$
$$= -(4) + 3$$
$$= \boxed{-1}$$

Exploration #1: Work with a partner.

1. Plot the following points:

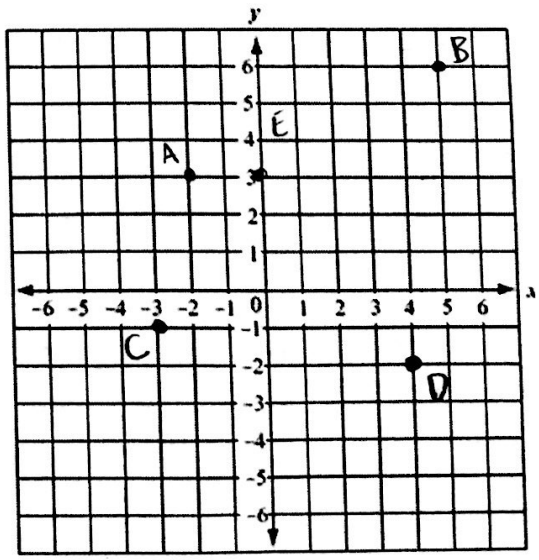
Point A: $(-2, 3)$

Point B: $(5, 6)$

Point C: $(-4, -1)$

Point D: $(4, -2)$

Point E: $(0, 3)$



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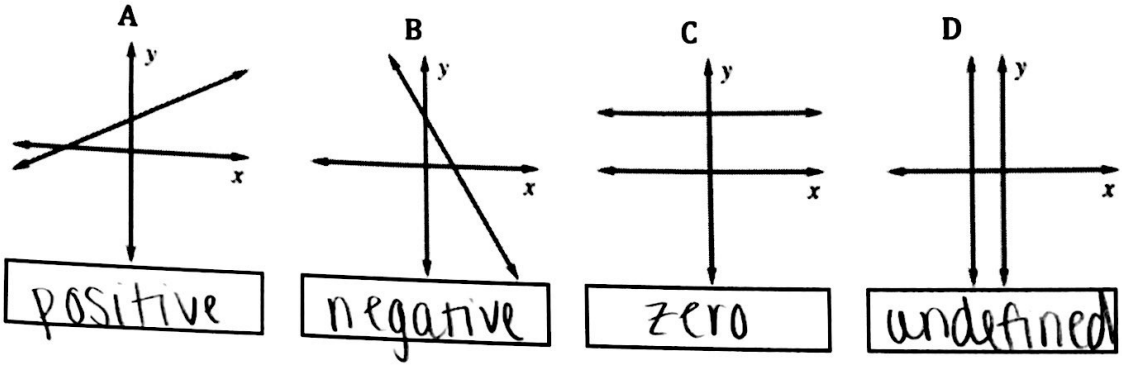
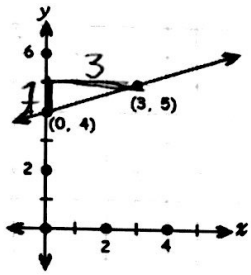
Notes:

Between any 2 points on a coordinate grid, there is exactly one line that can be drawn.
Slope is a number we use to describe steepness and direction of a line.
We use the variable m for slope.



The equation we use to calculate slope is:



$\frac{1}{3}$

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

$$= \frac{1}{3} = \frac{5-4}{3-0} = \frac{1}{3}$$

Example #1: Without graphing, tell whether the line through the given points *rises, falls,* is *horizontal,* or is *vertical.*

1. $(-6,-2),(1,3)$

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

rises

2. $(2,-1),(2,2)$

$m = \frac{2-(-1)}{2-2} = \frac{3}{0}$

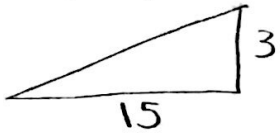
vertical

3. $(-3,2),(1,-4)$

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

falls

Example #2: Ms. Hentrich walked up a hill that was 15 feet long and 3 feet tall. What is the slope of this hill?



$\frac{\text{rise}}{\text{run}}$ $\frac{3}{15} = \boxed{\frac{1}{5}}$

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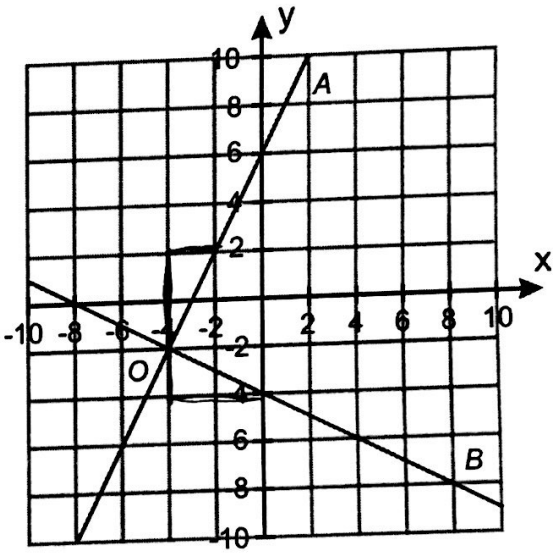
Exploration #2: Work with a partner.

1. Draw two lines that are *parallel*. What do you notice about the *slopes* of these lines?

2. Draw two lines that are *perpendicular*. What do you notice about the *slopes* of these lines?

3. Line A and Line B are perpendicular lines. Find the slope of the each line:



Line A:

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

Line B:

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

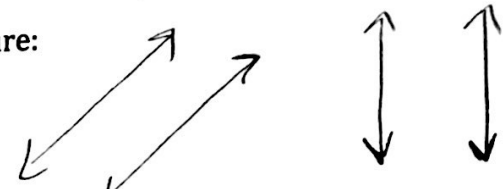
What do you notice?

opposite reciprocal

Notes:

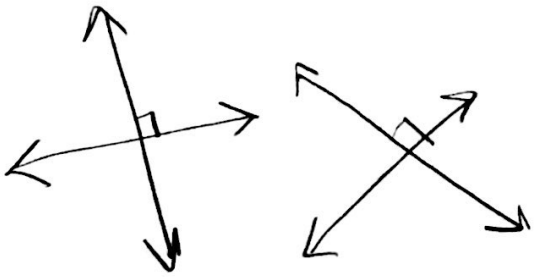
Lines are parallel if and only if they have the same slope.

Picture:



Lines are perpendicular if and only if their slopes are opposite reciprocal of each other.

Picture:



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Example #3: Tell whether the lines are *parallel, perpendicular,* or *neither.*

1. Line 1: through $(-3,-1)$ and $(2,5)$

   Line 2: through $(3,-4)$ and $(-3,1)$

Line 1: $m = \frac{5-(-1)}{2-(-3)} = \frac{6}{5}$

Line 2: $m = \frac{1-(-4)}{-3-3} = \frac{5}{-6}$

perpendicular

2. Line 1: through $(-4,-2)$ and $(1,7)$

   Line 2: through $(-2,-4)$ and $(3,5)$

Line 1: $m = \frac{7-(-2)}{1-(-4)} = \frac{9}{5}$

Line 2: $m = \frac{5-(-4)}{3-(-2)} = \frac{9}{5}$

parallel

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

1. Line 1: $2y = x - 4$

   Line 2: $y + 2x = 3$

$2y = x - 4$ $\quad$ $y + 2x = 3$

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

Opposite reciprocal slopes

perpendicular