

2.2 SLOPE AND RATE OF CHANGE

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

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

ALWAYS SIMPLIFY FRACTIONS!

a) $\frac{10}{4}$

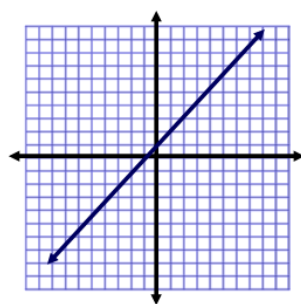
b) $\frac{3}{0}$

c) $\frac{0}{4}$

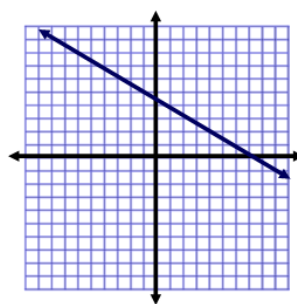
d) $\frac{-6}{-5}$

e) $\frac{1.25}{3}$

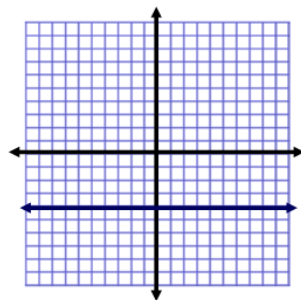
CLASSIFICATION OF LINES BY SLOPE



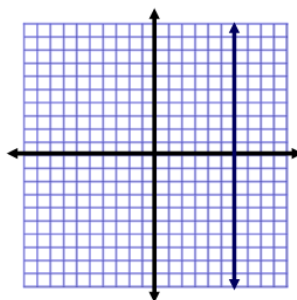
Positive Slope



Negative Slope



Zero Slope



Undefined Slope

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

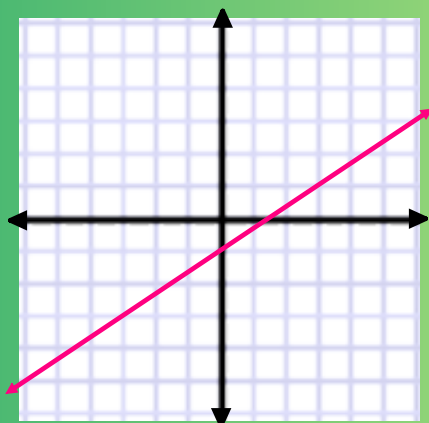
1. $(-3,5)$ & $(2,1)$

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

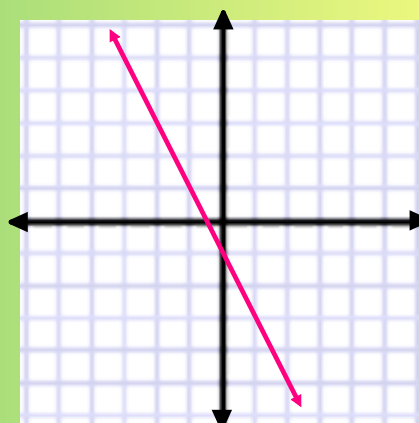
3. $(-6,-1)$, $(0,9)$

Examples: Find the slope of each line graphed below.

4.



5.



Two lines in a plane are **parallel** if they do not intersect.

The slopes of parallel lines are equal.

Two lines in a plane are **perpendicular** if they intersect to form a right angle.

The slopes of perpendicular lines are opposite reciprocals.

Examples

6. If $m = \frac{2}{5}$, then the m of the \perp line is $-\frac{5}{2}$.

7. If $m = \underline{-3}$, then the m of the \perp line is $\frac{1}{3}$.

8. Tell whether the lines through the following points are parallel, perpendicular, or neither. Also, tell which line is steeper.

* Line 1: $(-3, 3)$ and $(3, -1)$

* Line 2: $(-2, -3)$ and $(2, 3)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 3}{3 - (-3)}$$

$$= \frac{-4}{6} = \frac{-2}{3}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-3)}{2 - (-2)} = \frac{6}{4}$$

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

PERPENDICULAR

Line 2 is steeper.

Examples

9. Tell whether the lines through the following points are parallel, perpendicular, or neither. Also, tell which line is steeper.

* Line 1: $(-3, 1)$ and $(3, 4)$

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

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 1}{3 - (-3)}$$

$$= \frac{3}{6}$$

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

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-3)}{4 - (-4)}$$

$$= \frac{4}{8}$$

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

PARALLEL

They have the same steepness

Examples

10. Tell whether the lines through the following points are parallel, perpendicular, or neither. Also, tell which line is steeper.

* Line 1: $(\frac{1}{2}, -\frac{15}{8})$ and $(-4, -3)$

* Line 2: $(8, 6)$ and $(-12, 1)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - (-\frac{15}{8})}{-4 - \frac{1}{2}}$$

$$= \frac{-\frac{24}{8} + \frac{15}{8}}{-\frac{8}{2} - \frac{1}{2}} = \frac{-\frac{9}{8}}{-\frac{9}{2}}$$

$$= \frac{-\frac{9}{8} \cdot \frac{2}{-9}}{-\frac{9}{2} \cdot \frac{2}{-9}} = \frac{1}{4}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 6}{-12 - 8}$$

$$= \frac{-5}{-20}$$

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

PARALLEL

They have the same steepness.