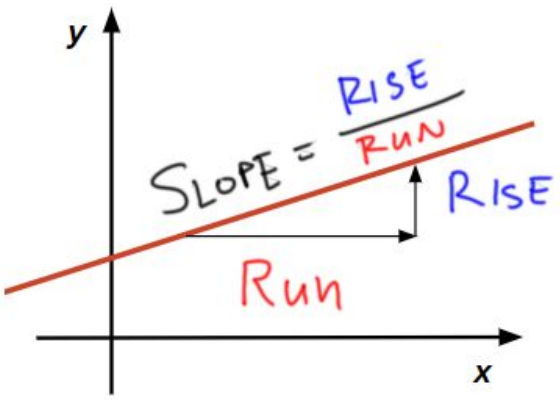
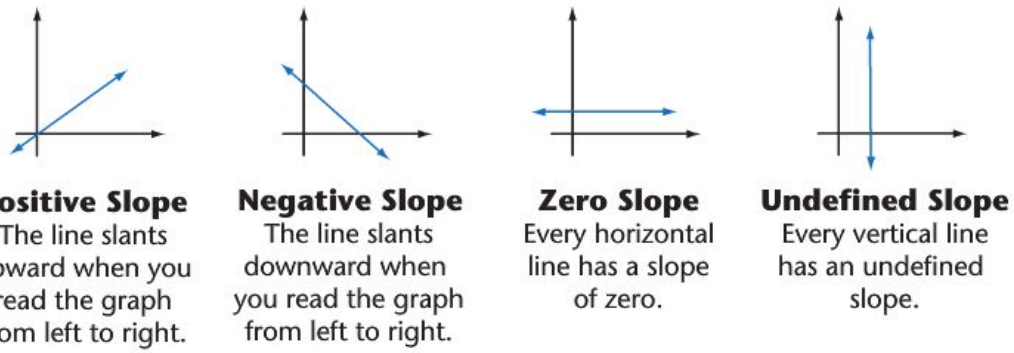
Slope

Slope is the ratio of the vertical change to the horizontal change between two points on a line.



Visually, slope describes the **steepness** of a graph. The larger the slope (positive or negative), the steeper the line.

There are four possibilities for the slope of a line.



Positive Slope
The line slants upward when you read the graph from left to right.

Negative Slope
The line slants downward when you read the graph from left to right.

Zero Slope
Every horizontal line has a slope of zero.

Undefined Slope
Every vertical line has an undefined slope.

Slope can be found many different ways. We use the letter *m* to represent slope.

$$slope\ m = \frac{rise}{run} = \frac{vertical\ change}{horizontal\ change} = \frac{change\ in\ y}{change\ in\ x}$$

For two points (point 1 and point 2) on a line, we can find the change in y and the change in x. We use the symbol delta (Δ) to represent change.

$$(x_1, y_1), (x_2, y_2) \longrightarrow m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Examples on the next page

Examples

Slope can be found from **graphs**, **tables**, and **sets of points**.

Find the slope of the line with the given points.

(a) (2, 8) & (-4, 3)

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$x_1\ y_1$ $x_2\ y_2$

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

$$= \frac{3-8}{-4-2} = \frac{-5}{-6}$$

$$\boxed{m = \frac{5}{6}}$$

- or, use a table -

x	y
2	8
-4	3

(-6 ↓, -5 →)

$$m = \frac{\Delta y}{\Delta x} = \frac{-5}{-6} = \frac{5}{6}$$

(b) (-3, 4) & (2, -9)

(b) $(-3, 4)$ & $(2, -9)$
$x_1\ y_1$ $x_2\ y_2$

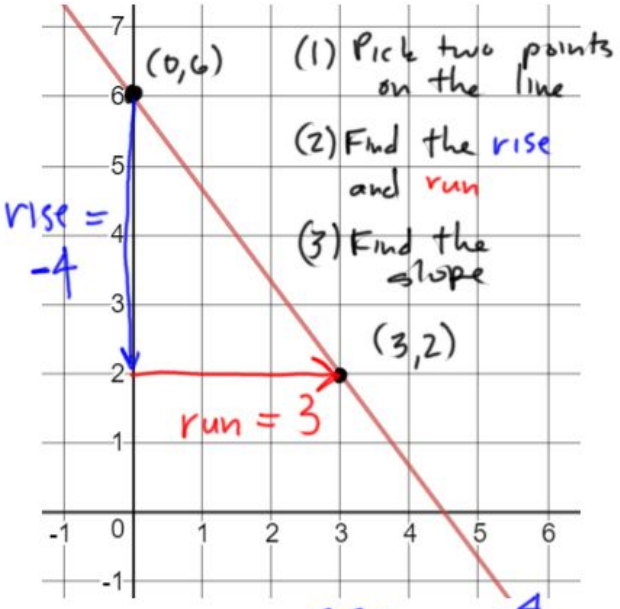
$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-9-4}{2--3} = \frac{-13}{5}$$

↑ keep the negative!

$$\boxed{m = -\frac{13}{5}}$$

Find the slope of the line from the graph.



$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-4}{3}$$

$$\boxed{m = -\frac{4}{3}}$$

Find the slope of the line from the table.

(1) Pick 2 points
★ Be strategic! ★

x_1	y_1
−2	5
0	4
3	2.5
4	2

(+4 ↓, -2 →)

(2) Find the change in x and the change in y

(3) Find the slope

$$\text{slope} = \frac{-2}{4} = -\frac{1}{2}$$

(Simplify!)