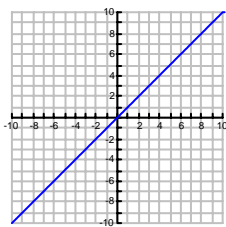


Objective 4.01 Slope

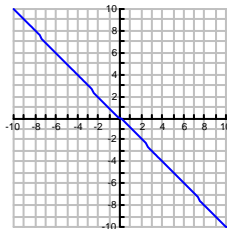
The slope of a line measures how quickly it rises or falls as x increases. Usually, we use m to represent the slope of a line.

The formula for slope is: $m = \frac{y_2 - y_1}{x_2 - x_1}$. Another way of remembering slope is $\frac{\text{rise}}{\text{run}}$.

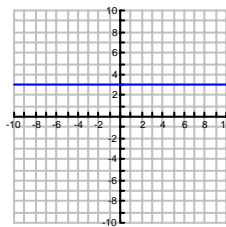
There are four types of slope:



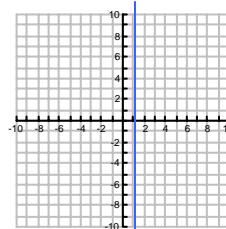
Positive



Negative



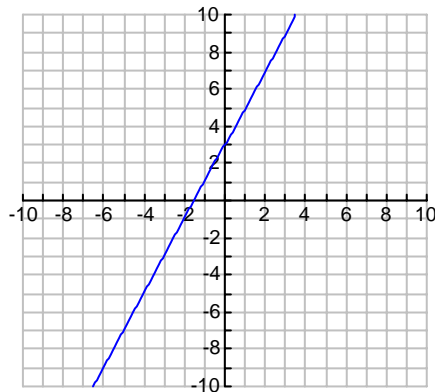
Zero



Undefined

Find the slope of the line:

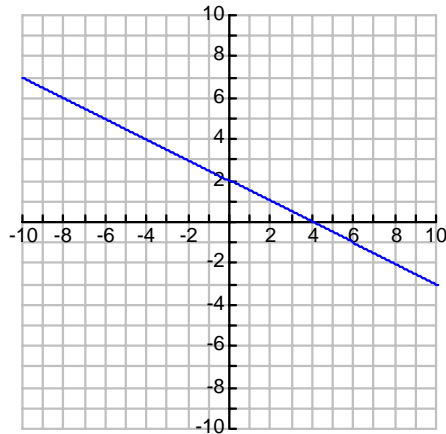
a.



Pick any two points from the graph: For example (0, 3) and (1, 5). From (0, 3) count up 2 and right 1 to get to the point (1, 5). This gives a slope of 2. If you were to start at (1, 5) you would count down 2 (which is negative) and left 1 (also negative). A negative divided by a negative is positive. Either way, you get a slope of positive 2.

***It doesn't matter what points you pick—you will get the same answer. The slope of a line stays the same.

b.



Two points: (2, 1) and (0, 2). From (2, 1) count up 1 and left 2. The slope is $-\frac{1}{2}$

Find the slope of the line passing through the points:

a. $(9, 8)$ $(3, 0)$
 ↑ ↑ ↑ ↑
 x_1 y_1 x_2 y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{0 - 8}{3 - 9} \quad m = \frac{-8}{-6} \quad m = \frac{4}{3}$$

The slope of the line is $\frac{4}{3}$.

b. $(1, 12)$ $(-1, -4)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{-4 - 12}{-1 - 1} \quad m = \frac{-16}{-2} \quad m = 8$$

The slope of the line is 8.

c. (2, 0) (2, 4)

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{4 - 0}{2 - 2} \quad m = \frac{4}{0} \quad m = \text{UNDEFINED}$$

The slope is undefined.

d. (3, 3) (-2, 3)

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad m = \frac{3 - 3}{-2 - 3} \quad m = \frac{0}{-5} \quad m = 0$$

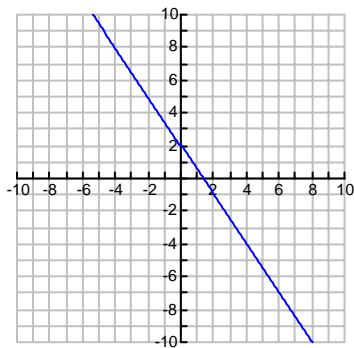
The slope is zero.

You try:

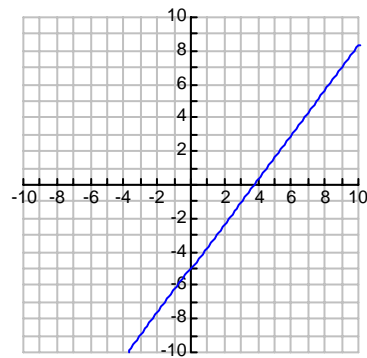
Find the slope of the line passing through each pair of points.

1. (-7, 1) (7, 8)
2. (3, 2) (5, 6)
3. (0, -1) (1, -6)
4. (-5, 0.5) (-5, 3)

5.



6.



Answers:

- 1) $\frac{1}{2}$ 2) 2 3) -5 4) undefined 5) $-\frac{3}{2}$ 6) $\frac{4}{3}$

Linear Equations

A “line”ar equation is an equation of a LINE.

There are three common forms of linear equations.

- I. Slope Intercept Form
- II. Point-Slope Form
- III. Standard Form

I. Slope intercept Form

$$y = mX + b$$

↑ ↑
slope y-intercept

The *y-intercept* is where the line crosses the y-axis.

Example:

- a. Write an equation of the line with a slope of -1 and y-intercept of 2 .
The question gives you the following information: $m = -1$ $b = 2$
Now just put the values into the formula

$$y = -x + 2$$

b. Find the slope and y-intercept : $3 + 2x + y = 0$
Put the equation given in slope intercept form:

$$\begin{array}{r} 3 + 2x + y = 0 \\ -3 - 2x \quad -3 - 2x \\ \hline y = -2x - 3 \end{array}$$

$$m = -2 \quad b = -3$$

c. Graph the line using the slope and y-intercept

$$y = -2x + 3$$

$$y = \frac{5}{2}x$$

II. Point Slope

The formula for point-slope is $y - y_1 = m(x - x_1)$.

$$\begin{array}{ccc} \uparrow & \uparrow & \uparrow \\ \text{y-coordinate} & \text{slope} & \text{x-coordinate} \end{array}$$

Examples:

a. Determine the point and slope of the following equation:

$$y - 2 = 3(x + 4)$$

the point is (2, -4), and the slope is 3. (In the formula there is a subtraction sign, so your ordered pair ends up being opposite.)

b. Write the equation of the line with a slope of -2 that passes through the point (1,-3)

You are given a POINT and a SLOPE, so you can use POINT-SLOPE!

$$y + 3 = -2(x - 1) \quad \text{What if we wanted to change this to Slope-intercept Form?}$$

$$y + 3 = -2x + 1 \quad \text{(Distribute)}$$

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

c. Use the graph to write the equation of the line.

III. Standard Form:

$$Ax + By = C$$