Consider the linear equation \( y = x - 2 \).

Let’s see how we can move from one point to another on the line. Remember that the arrows on the axes represent the positive direction.

To get from (0, -2) to (-1, -3):

To get from (-1, -3) to (2, 0):

To get from (2, 0) to (0, -2):

We can take the ratio of vertical change (up/down) to horizontal change (right/left), in other words, we look at…

This ratio is the numerical measure of the “steepness” or “slant” of the line and is called its ________.

**Slope**

\[ m = \frac{\text{rise}}{\text{run}} \]

**Note:** Since slope is a ratio of change, it is actually an average rate of change between 2 points!

**Example 1:** Graph \( y = -\frac{1}{2}x + 1 \) to find its slope.

\[ m = \text{slope} = \frac{\text{rise}}{\text{run}} = \]

Check the slope, using the definition.

\[ m = \]

Notice that it does NOT matter which point you designate as \((x_1, y_1)\) and which you designate as \((x_2, y_2)\), as long as you are consistent!
More on Slope

As $x$ values increase left to right…

As $x$ values increase left to right…

The larger the _____________ of the slope, the “steeper” the line (when looking at lines with positive and negative slopes separately).

Horizontal and Vertical Lines

Horizontal Lines

$y = b$

Vertical Lines

$x = a$

Example 2: Graph the following and determine the slope of the line.

a) $x = \frac{3}{4}$

b) $y = -4$
Earlier, we determined the slope, \( m \), of \( y = -\frac{1}{2}x + 1 \) is \( m = -1/2 \). Notice that this equation is in the form \( y = mx + b \) where \( m = \ldots \) and \( b = \ldots \).

The slope of a linear equation in two variables written in the form \( y = mx + b \) is just \_ \_ \_ \_ !

So what is \( b \)? Set \( x = 0 \). Then \( y = \ldots \) which is the \_______________.

**Example 3:** Find the slope and \( y \) intercept of \( 2x - 3y = 6 \) by writing the equation in slope intercept form. Graph the line.

Note that every linear equation in two variables, except for \______________ lines can be written in the form \( y = mx + b \).
Example 5: Find the equation of the line shown. Write your answer in slope-intercept form.

Applications of Slope

Slope represents an average rate of change between two points and is also used in other applications, such as the grade of a road or pitch of a roof.

Units on Slope:

Since slope is defined as the change in $y$ over the change in $x$, the units of slope are the units of $y$ over the units of $x$. In other words, units of slope =

Consider the example of distance versus time, where time (in hours) is $x$, and distance (in miles) is $y$:

If we found the slope of this line, $m$, the units of it would be …

Here, $m =$
Slope can also be used to find the **average rate of change between two points**.

Suppose that in a rectangular coordinate system the horizontal axis represents the number of stereos a company produces, and the vertical axis represents the profit (in dollars) the company earns on the production of that many stereos. How would you interpret the slope of the line segment joining the points (0,0) and (100,875)?

\[
\text{Slope } m = \frac{875 - 0}{100 - 0} = \frac{875 \text{ dollars}}{100 \text{ stereo}} = 8.75 \text{ dollars per stereo}
\]

**Profit increases $8.75 per stereo produced.**