Introduction to Mathematics

Week 3

Formation of Equation

- **Unit 3.3**

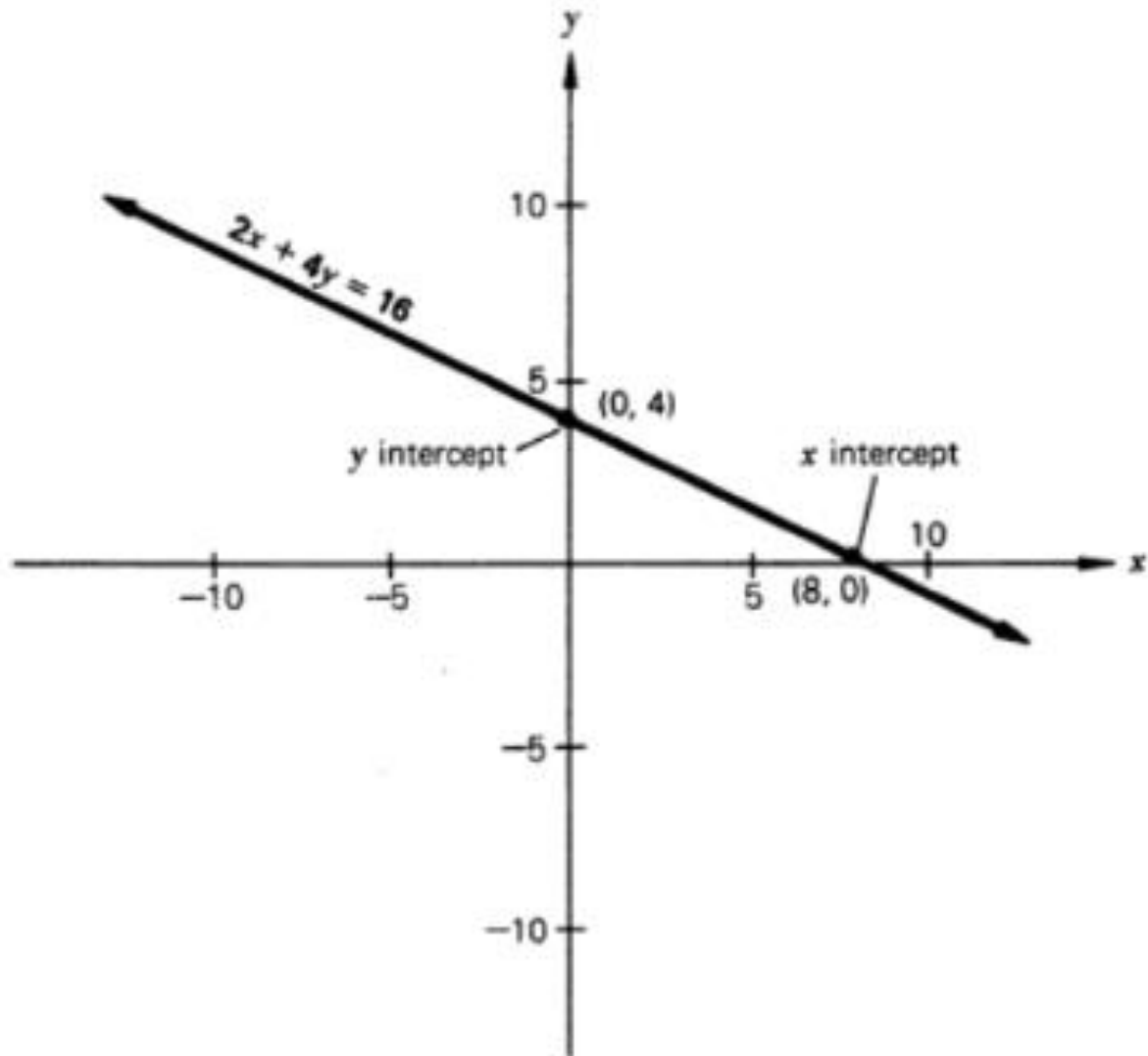**Slope, x-intercept and y-intercept**

Learning Outcomes

- To be able to evaluate the slope and intercepts of the equation
- To be able to graphically represent a Linear Equation

Graph of an Equation

Graph the following equation:

$$2x + 4y = 16$$

- We need to first identify two pairs of values of x and y which satisfy the equation.
- An easy way is to put x = 0, we get the value of y = 4.
- Then put y = 0, we get the value x = 8.
- Thus (0,4) and (8,0) are two members of the solution set.
- These two points are plotted in the graph in the next slide and the points are connected by a straight line

Characteristics of Graphs

- **X-intercept**
  The x-intercept of an equation is the point where the graph of the equation crosses the x-axis, i.e. y=0.

- **Y-intercept**
  The y-intercept of an equation is the point where the graph of the equation crosses the y-axis, i.e. x=0
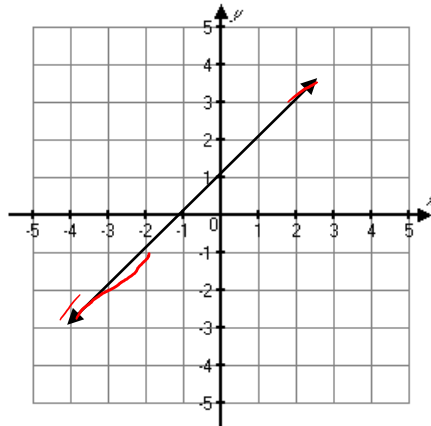
- **Slope**
  Any straight line with the exception of vertical lines can be characterized by its slope. Slope represents the inclination of a line or equivalently it shows the rate at which the line raises and fall or how steep the line is.
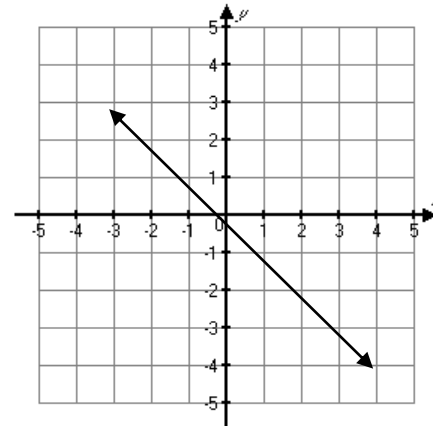
Slope of Line

- The slope of a line, m, is a measure of how steeply a line rises or falls as it moves to the right.

- If a line rises as it moves to the right, then its slope is positive.

- If a line falls as it moves to the right, then its slope is negative.

Positive Slope   Negative Slope

- $m > 0$ $m < 0$

- Line rises from   Line falls from

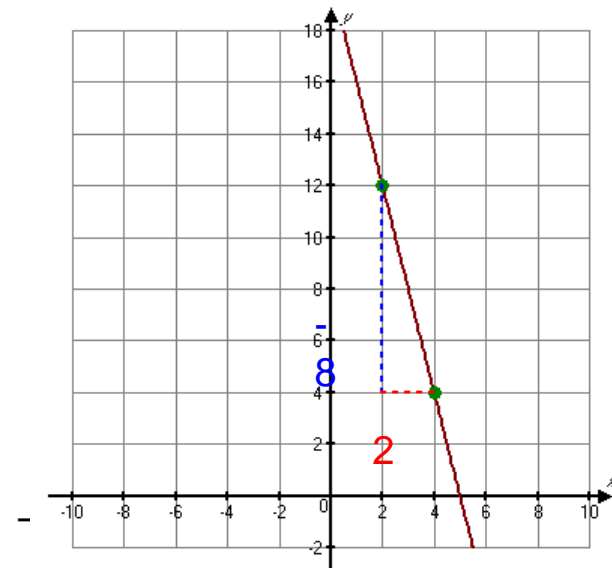- left to right.   left to right.

Find the slope of (2, 12) and (4, 4).

Solution

Begin by plotting the two points on a graph.

Line falls from left to right, so its slope is negative.

Slope = $-\dfrac{8}{2} = -4$

Slope Formula

If a line passes through two points (x_1, y_1) and (x_2, y_2) then we can calculate its slope using the formula

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

Slope Formula

Find the slope of the line that passes through the two points:

$$\left(4,-7\right),\ \left(6,3\right)$$

$$m = \frac{3-\left(-7\right)}{6-4}$$

$$= \frac{10}{2}$$

$$= 5$$

Slope of a Horizontal or Vertical Line

The slope of a horizontal line is 0.

The slope of a vertical line is undefined.

x and y -intercepts

- The **x-intercept** is the point where a line crosses the x-axis.

  The general form of the x-intercept is $(x, 0)$. The y-coordinate will always be zero.

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

  The general form of the y-intercept is $(0, y)$. The x-coordinate will always be zero.

Finding the x-intercept

- For the equation $2x + y = 6$, we know that *y* must equal 0. What must *x* equal?

- Plug in 0 for *y* and simplify.

  $2x + 0 = 6$

  $2x = 6$

  $x = 3$

- So (3, 0) is the *x*-intercept of the line.

Finding the y-intercept

- For the equation $2x + y = 6$, we know that x must equal 0. What must y equal?

- Plug in 0 for x and simplify.
$2(0) + y = 6$
$0 + y = 6$
$y = 6$

- So $(0, 6)$ is the y-intercept of the line.

Find the x and y- intercepts of x = 4y − 5

- **x-intercept:**
- Plug in $y = 0$

$$x = 4y - 5$$
$$x = 4(0) - 5$$
$$x = 0 - 5$$
$$x = -5$$

- $(-5, 0)$ is the x-intercept

- **y-intercept:**
- Plug in $x = 0$

$$x = 4y - 5$$
$$0 = 4y - 5$$
$$5 = 4y$$
$$\frac{5}{4} = y$$

- $(0, \frac{5}{4})$ is the y-intercept

Find the x and y-intercepts of g(x) = -3x – 1*

- **x-intercept**
- Plug in $y = 0$

$$g(x) = -3x - 1$$
$$0 = -3x - 1$$
$$1 = -3x$$
$$-\frac{1}{3} = x$$

- $(-\frac{1}{3}, 0)$ is the x-intercept

*$g(x)$ is the same as y

- **y-intercept**
- Plug in $x = 0$

$$g(x) = -3(0) - 1$$
$$g(x) = 0 - 1$$
$$g(x) = -1$$

- $(0, -1)$ is the y-intercept

Find the x and y-intercepts of x = 3
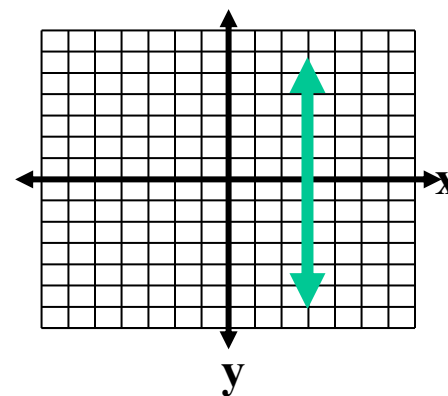
- ***x*-intercept**

- Plug in $y = 0$.

  There is no y. Why?

- $x = 3$ is a vertical line so x always equals 3.

- (3, 0) is the x-intercept.

- ***y*-intercept**

- A vertical line never crosses the y-axis.

- There is no y-intercept.

Find the x and y-intercepts of y = -2

- **_x_-intercept**

- Plug in $y = 0$.
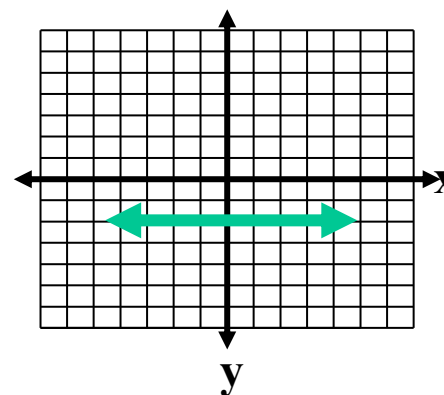
   y cannot $= 0$ because

   $y = $ -2.
- $y = $ -2 is a horizontal

   line so it never crosses

   the _x_-axis.

- There is no _x_-intercept.

- **_y_-intercept**

- $y = $ -2 is a horizontal line

   so _y_ always equals -2.

- (0,-2) is the _y_-intercept.

Helping Material

- https://www.khanacademy.org/math/algebra-home/alg-basic-eq-ineq/alg-old-school-equations/v/algebra-linear-equations-1
- https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:linear-equations-graphs/x2f8bb11595b61c86:x-intercepts-and-y-intercepts/v/introduction-to-intercepts
- https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:linear-equations-graphs/x2f8bb11595b61c86:x-intercepts-and-y-intercepts/v/finding-x-intercept-of-a-line
- https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:linear-equations-graphs/x2f8bb11595b61c86:slope/v/introduction-to-slope
- https://www.youtube.com/watch?v=9bm1_IJ00lQ

Thank you