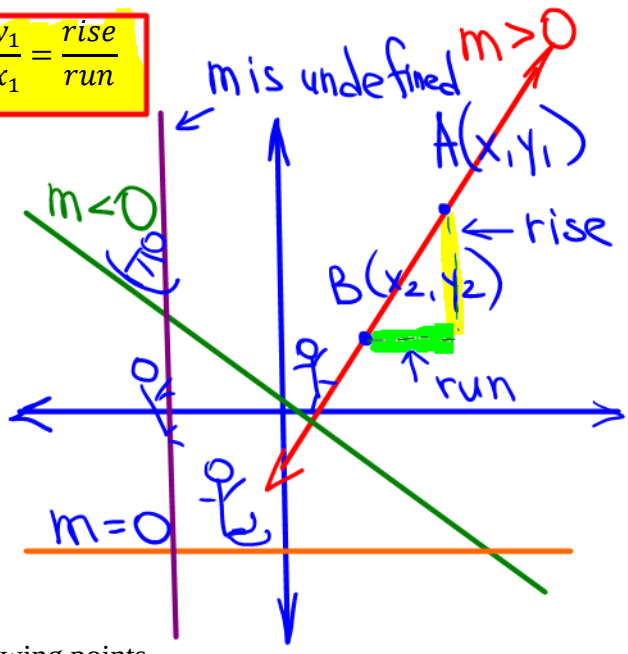
Math 1300 Section 2.3

Section 2.3: Slope and Intercepts of a Line

Definition: The **slope** of a line measures the steepness of a line or the rate of change of the line.

To find the slope of a line you need two points. You can find the slope of a line between two points (x_1, y_1) and $(x_2, y_2)$by using this formula.

$$slope\ (m) = \frac{y_2 - y_1}{x_2 - x_1} = \frac{rise}{run}$$



The Different Types of slope

- Lines with positive slope rise to the right.
- Lines with negative slope fall to the right.
- Lines with slope equal to 0 are horizontal lines.
- Lines with undefined slope are vertical lines

Example 1: Find the slope of the line containing the following points

a. $(4, -3)$ and $(-2, 1)$

$x_1\ y_1 \qquad x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-(-3)}{-2-4} = \frac{1+3}{-6} = \frac{4}{-6} = \boxed{-\frac{2}{3}}$$

b. $(-3, 1)$ and $(-3, -2)$

$x_1\ y_1 \qquad x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-1}{-3-(-3)} = \frac{-3}{0} \quad \text{undefined}$$

c. $\left(-2, \frac{1}{4}\right)$ and $\left(1, \frac{3}{4}\right)$

$x_1\ y_1 \qquad x_2\ y_2$

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

$$= \frac{1}{2} \div 3 = \frac{1}{2} \cdot \frac{1}{3} = \boxed{\frac{1}{6}}$$

The *x*-coordinate of the point where a line intersects the *x*-axis is called the ***x*-intercept**. It is found by setting $y = 0$ in the equation of the line and solving for x.

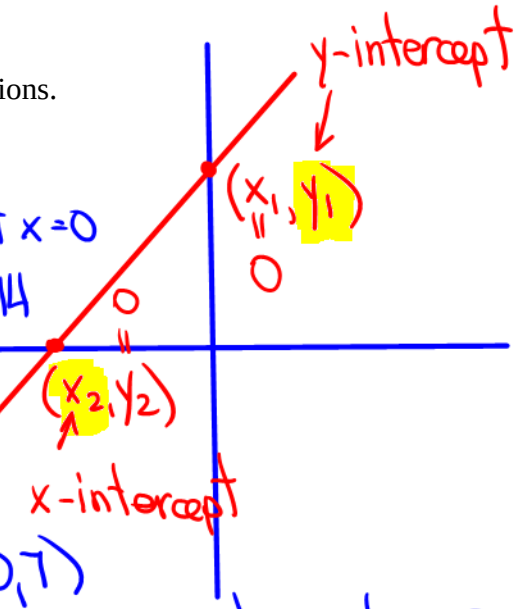
The *y*-coordinate of the point where a line intersects the *y*-axis is called the ***y*-intercept**. It is found by setting $x = 0$ in the equation of the line and solving for y.

Example 2: Find the x - and y - intercepts of the following equations.

a. $7x + 2y = 14$

x-intercept: 1. set $y=0$
(2,0)
2. $7x+2(0)=14$
3. solve
$7x = 14$
$x = 2$

y-int: 1. set $x=0$
$7(0)+2y=14$
solve
$2y=14$
$y=7$



b. $3y = \frac{2}{5}x$

x-int: set $y=0$
$3(0) = \frac{2}{5}x$
$5 \cdot 0 = \frac{2}{5}x$
$0 = 2x$
$0 = x$
(0,0)

y-int. set $x=0$
$3y = \frac{2}{5}(0)$
$3y = 0$
$y = 0$

The term intercept also refers to the POINT at which the graph of the line crosses either the x-axis or the y-axis. Sometimes, the question will ask you to write the y-intercept or y-intercept "as a coordinate point" or "in coordinate point form". To answer this question, the procedure is

x- intercept as a coordinate point –

1. Find the x-intercept by setting y = 0 and solving the equation for x.
2. Write the point as (x-intercept, 0)

y-intercept as a coordinate point –

1. Find the y-intercept by setting x = 0 and solving the equation for y.
2. Write the point as (0, y-intercept)

Example 3: Find the x- and y- intercepts of the line $3x - 2y = 18$ and express the intercepts in coordinate point form.

x-int.: set $y=0$
$3x-2(0)=18$
$\frac{3x}{3} = \frac{18}{3}$
$x = 6$
(6,0)

y-int: set $x=0$
$3(0)-2y=18$
$\frac{-2y}{-2} = \frac{18}{-2}$
$y = -9$
(0,-9)

Example 4: Find the x- and y- intercepts of the line $2y = 14$ and express the intercepts in coordinate point form.

x-int.: $y=0$

$2(0)=14$

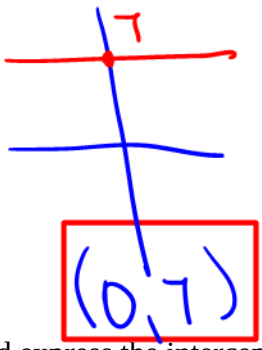
$0 \neq 14$

DNE

$\frac{2y}{2}=\frac{14}{2}$

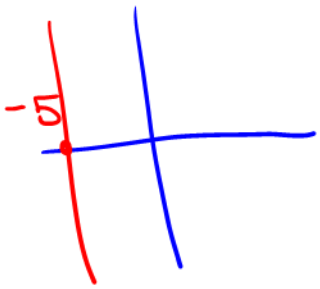
$y=7$

y-int. $y=7$



$(0,7)$

Example 5: Find the x- and y- intercepts of the line $x = -5$ and express the intercepts in coordinate point form



y-int. DNE

x-int. $x=-5$

$(-5,0)$

Example 6: Find the x- and y- intercepts of the line $-3x = 15$ and express the intercepts in coordinate point form

$\frac{-3x}{-3}=\frac{15}{-3}$

$x=-5$

y-int. DNE

x-int. $x=-5$ $(-5,0)$