GRAPHING LINEAR FUNCTIONS

If (x_1, y_1) and (x_2, y_2) are points on a line, then the slope of the line, m, is:

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

The slope of the line is constant.

Ex1 Determine whether each set could represent a linear function.

a)

		2	2	2
x	0	2	4	6
$f(x)$	-1	2	5	8
		3	3	3

$m = \frac{change\ in\ y}{change\ in\ x}$ or $\frac{\Delta y}{\Delta x} = \frac{3}{2}$. The rate is constant, therefore this is a linear function with a slope of $\frac{3}{2}$.

b)

		3	3	3
x	-1	2	5	8
$f(x)$	0	1	3	6
		1	2	3

$m = \frac{change\ in\ y}{change\ in\ x}$ or $\frac{\Delta y}{\Delta x} = \frac{1}{3} \neq \frac{2}{3} \neq \frac{3}{3}$. The rate is not constant, therefore this is not a linear function.

Slope-Intercept Form of a Line

$y = mx + b$

$m =$ slope

$b = y$-intercept

where $(0, b)$ is the location of the y-intercept

Ex2 Graph using the slope-intercept form.

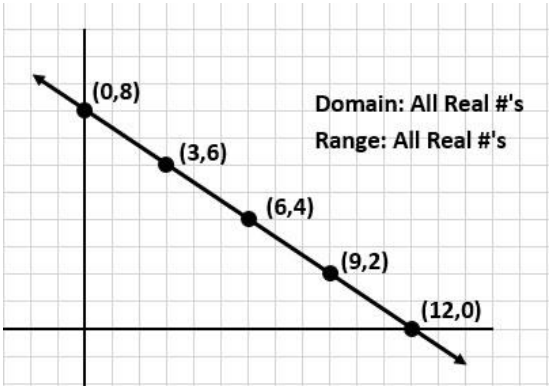
$$\frac{3y}{3} = \frac{-2x}{3} + \frac{24}{3}$$

$y = -\frac{2}{3} + 8$ therefore, $m = -\frac{2}{3}$

y −intercept is located at $(0,8)$

Use the y −intercept as the first point to plot on the graph.

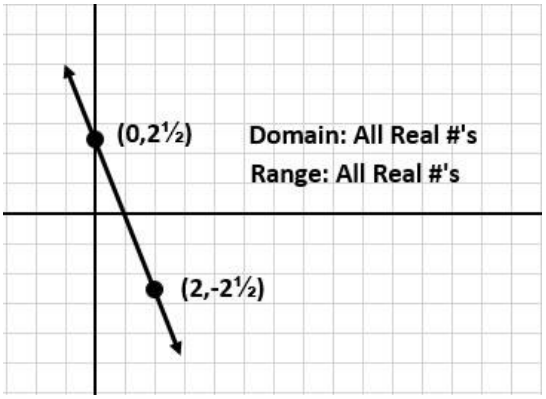
Use the slope to find a second point on the graph.



Ex3 Graph using the slope-intercept form.

$$5x + 2y = 5$$
$$-5x \qquad -5x$$
$$\frac{2y}{2} = \frac{-5x}{2} + \frac{5}{2}$$
$$y = -\frac{5}{2} + \frac{5}{2}$$ therefore, $m = -\frac{5}{2}$

y −intercept is located at $\left(0, \frac{5}{2}\right)$



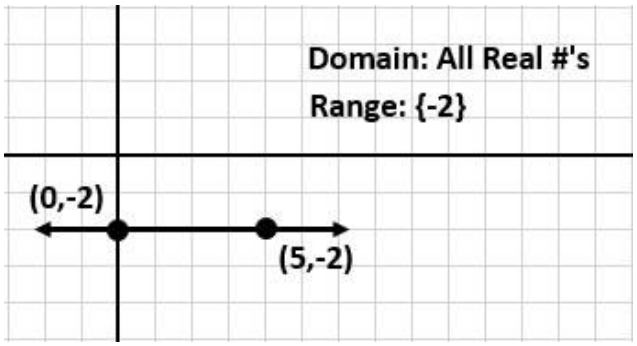
Horizontal lines have a slope$= 0$.

The equation of a horizontal line is: $y =$ constant.

Ex4 Graph $\frac{3y}{3} = \frac{-6}{3}$

$y = -2$ therefore, $m = 0$

y −intercept is located at $(0, -2)$



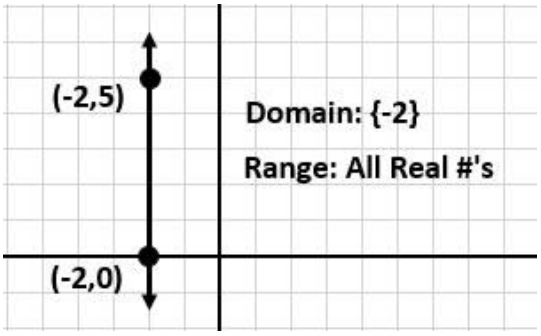
Vertical lines have an undefined slope.

The equation of a vertical line is: $x =$ constant.

Ex5 Graph $\frac{-2x}{-2} = \frac{4}{-2}$

$x = -2$ therefore, $m =$ undefined

x −intercept is located at $(-2,0)$



Standard Form of a Line

The standard form of a line is $Ax + By = C$ where:

1. $A > 0$
2. $A, B \text{ and } C$ are integers
3. The GCF of $A, B \text{ and } C$ is 1.

Ex6 Find the $x - intercept$ and $y - intercept$, then graph the line using those intercepts.

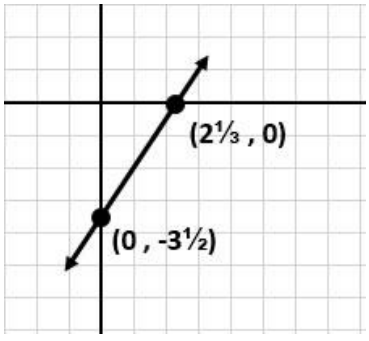
$$3x - 2y = 7$$

To find the $x - int$, set $y = 0$

$$3x - 2(0) = 7$$
$$3x = 7$$
$$x = \frac{7}{3}$$
$$x - int = \left(\frac{7}{3}, 0\right)$$

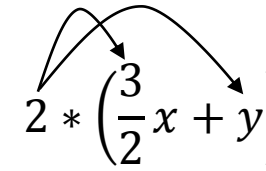
To find the $y - int$, set $x = 0$

$$3(0) - 2y = 7$$
$$-2y = 7$$
$$y = -\frac{7}{2}$$
$$y - int = \left(0, -\frac{7}{2}\right)$$



Ex7 Put in standard form and find the two intercepts.

$y = -\frac{3}{2}x + 7$ $\qquad\qquad$ $Ax + By = C$



$2 * \left(\frac{3}{2}x + y\right) = (7) * 2$

$\boxed{3x + 2y = 14}$ Standard Form

To find the $x - int$,
set $y = 0$

$3x + 2(0) = 14$
$3x = 14$
$x = \frac{14}{3}$
$x - int = \left(\frac{14}{3}, 0\right)$

To find the $y - int$,
set $x = 0$

$3(0) + 2y = 14$
$2y = 14$
$y = 7$
$y - int = (0\,, 7)$

Ex8 Put in standard form and find the two intercepts.

$$y - \frac{2}{3} = \frac{5}{6}(x - 3)$$

$$y - \frac{2}{3} = \frac{5}{6}x - \frac{5}{2}$$

$$6 * \left(-\frac{5}{6}x + y\right) = \left(\frac{2}{3} - \frac{5}{2}\right) * 6$$

$$-5x + 6y = 4 - 15$$

$$-5x + 6y = -11$$

$$\boxed{5x - 6y = 11}$$ Standard Form

To find the $x - int$, set $y = 0$

$$5x - 6(0) = 11$$
$$5x = 11$$
$$x = \frac{11}{5}$$
$$x - int = \left(\frac{11}{5}, 0\right)$$

To find the $y - int$, set $x = 0$

$$5(0) - 6y = 11$$
$$-6y = 11$$
$$y = -\frac{11}{6}$$
$$y - int = \left(0, -\frac{11}{6}\right)$$