

Graphing Lines

Slope-intercept Form:

$$y = mx + b$$

where m is the slope and $(0,b)$ is
the y -intercept

Standard Form:

$$Ax + By = C$$

$$x\text{-int } \left(\frac{c}{A}, 0\right), y\text{-int } \left(0, \frac{c}{B}\right), m = -\frac{A}{B}$$

Intercepts:

Points where the line intersects
an axis $(0,y)$ and $(x,0)$.

Example 1 Slope-intercept form

$$y = mx + b$$

- m is the slope
- $(0, b)$ is the y-int
- to find the x-int $(x, 0)$ substitute 0 for y and solve for x
- to graph plot either of the intercepts (avoid fractions or decimals) and use the slope to locate more points

$$y = \frac{5}{2}x + 10$$

Slope: $m = \frac{5}{2}$ rise or fall run right run left

y-intercept:

$$\frac{5}{2}(0) + 10 = 10$$

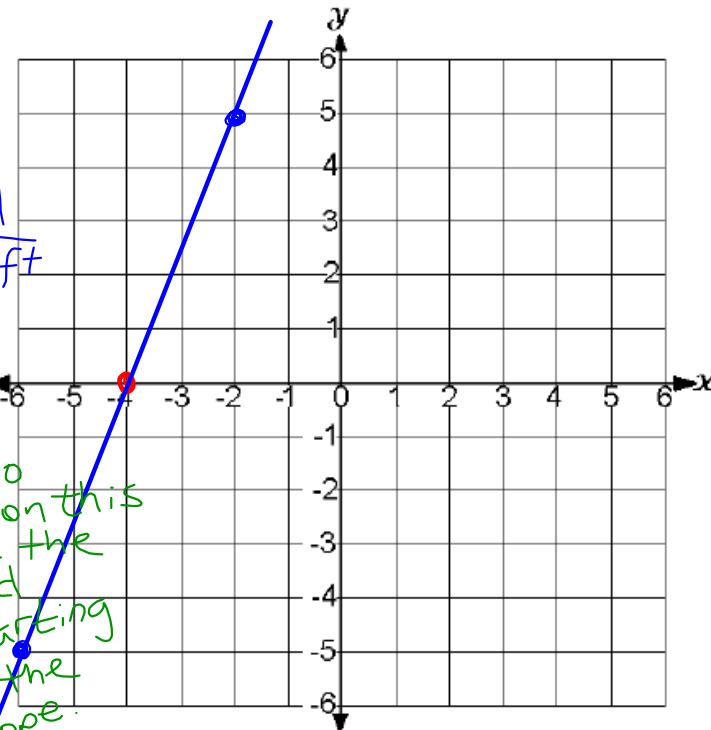
x-intercept:

$$0 = \frac{5}{2}x + 10$$
$$\frac{-10}{\frac{5}{2}} = \frac{5x}{2}$$
$$-4 = x$$

$$\frac{-20}{5} = x$$

$$-4 = x$$

$$(-4, 0)$$



On your whiteboard...

$$y = mx + b$$

- m is the slope
- $(0,b)$ is the y-int
- to find the x-int $(x,0)$ substitute 0 for y and solve for x
- to graph plot either of the intercepts (avoid fractions or decimals) and use the slope to locate more points

$$y = \frac{3}{2}x + 1$$

Slope:

$$m = \frac{3}{2}$$

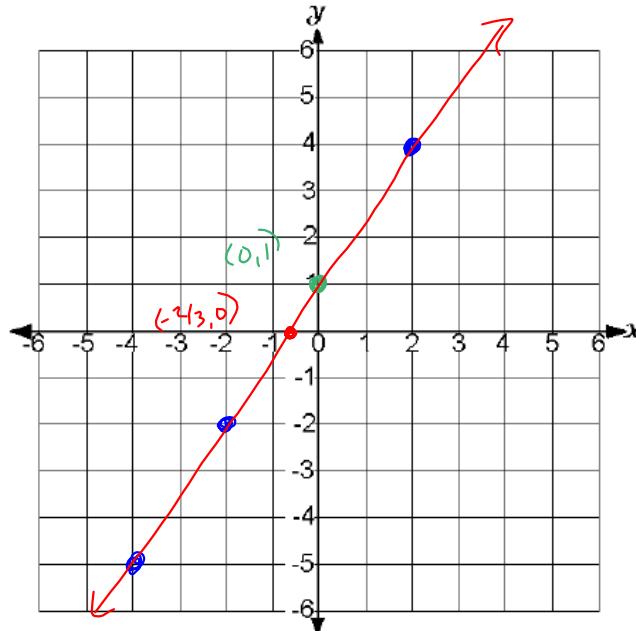
y-intercept:

$$(0, 1)$$

x-intercept:

$$\begin{aligned} 0 &= \frac{3}{2}x + 1 \\ -1 &= \frac{3}{2}x \\ -\frac{2}{3} &= x \end{aligned}$$

$$\left(-\frac{2}{3}, 0\right)$$



On your whiteboard...

$$y = -\frac{1}{2}x + 2$$

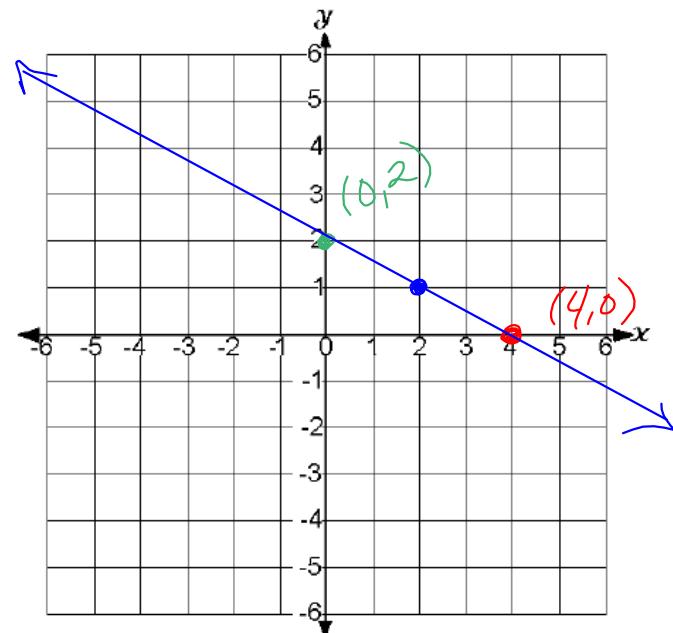
Slope: $m = -\frac{1}{2}$ = $\frac{\text{fall}}{\text{run right}}$ or $\frac{\text{rise}}{\text{run left}}$

y-intercept: $(0, 2)$

x-intercept: $0 = -\frac{1}{2}x + 2$

$$\begin{array}{r} \frac{-2}{(-2)} \\ (-2) = \left(\frac{-1}{2}\right)(-2) \end{array}$$

$$4 = x \quad (4, 0)$$



Example 2 Standard form

$$Ax + By = C$$

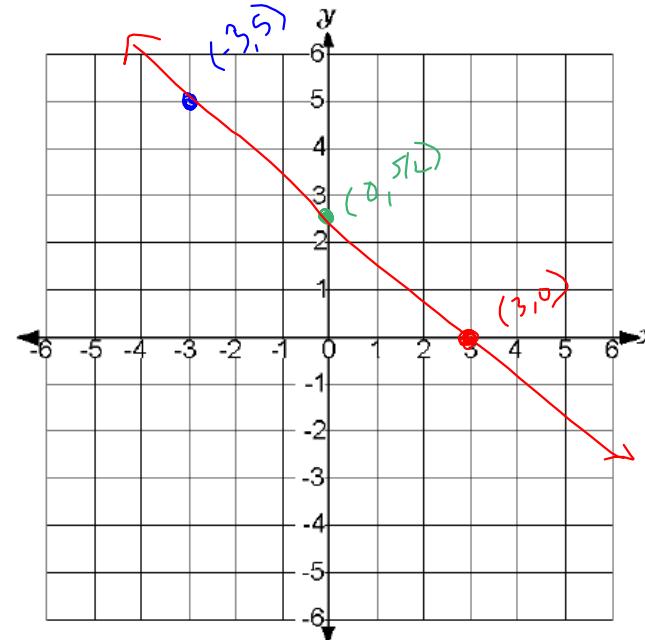
- the x-int is $\left(\frac{C}{A}, 0\right)$
- the y-int is $\left(0, \frac{C}{B}\right)$
- the slope is $-\frac{A}{B}$
- to graph plot either of the intercepts (avoid fractions or decimals) and use the slope to locate more points

$$A=5 \quad B=6 \quad C=15$$
$$5x + 6y = 15$$

x-intercept:
 $(\frac{15}{5}, 0) \rightarrow (3, 0)$

y-intercept:
 $(0, \frac{15}{6}) \rightarrow (0, \frac{5}{2})$

Slope: $m = -\frac{5}{6}$



On your whiteboard...

$$4x - 3y = 12$$

$$A=4 \quad B=-3 \quad C=12$$

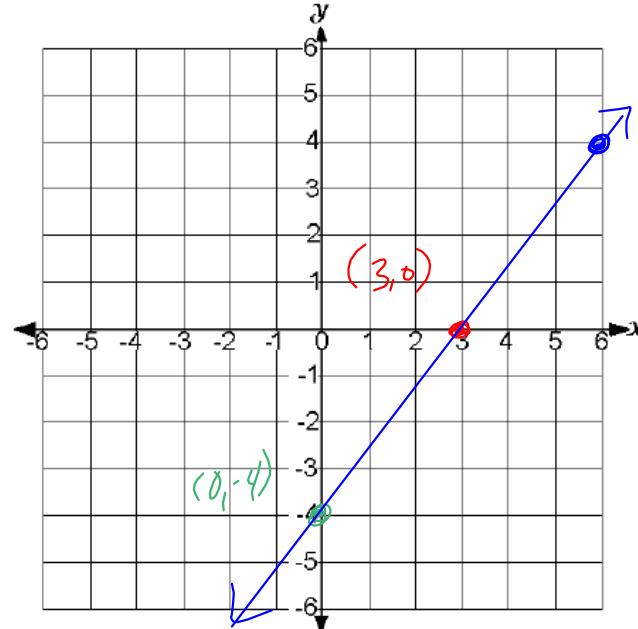
x-intercept:

$$\left(\frac{C}{A}, 0\right) \quad \left(\frac{12}{4}, 0\right) \quad (3, 0)$$

y-intercept:

$$(0, \frac{C}{B}) \quad (0, \frac{12}{-3}) \quad (0, -4)$$

Slope: $M = -\frac{A}{B} = -\frac{4}{-3} = \frac{4}{3}$



Example 3 Other forms

Rewrite the equation of the line in either slope-intercept form or standard form first. Then find the slope, both intercepts, and graph.

$$2(3x + 5) = -3y + 10$$
$$6x + 10 = -3y + 10$$
$$\underline{+3y} \quad \underline{+3y}$$

$$6x + 3y + 10 = 10$$
$$\underline{-10} \quad \underline{-10}$$

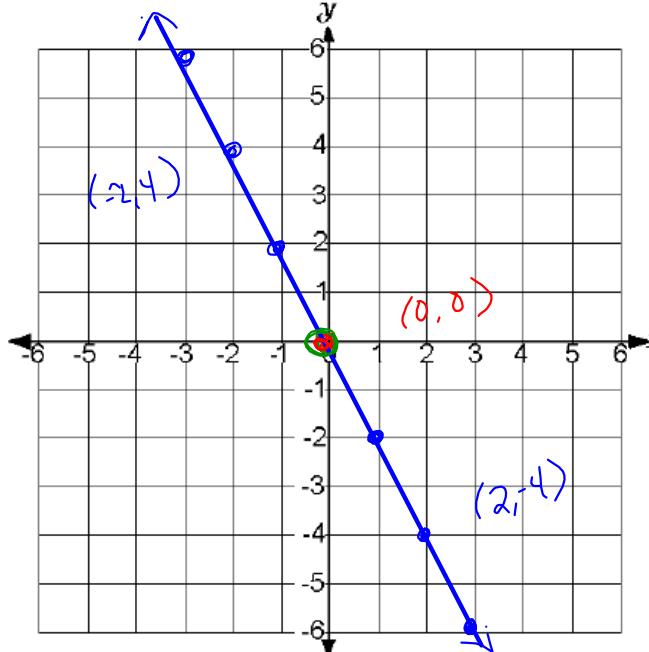
$$6x + 3y = 0$$

Standard form

y-intercept:
 $(0, \frac{0}{3}) = (0, 0)$

Slope:
 $m = \frac{-6}{3} = -2$

x-intercept:
 $(\frac{0}{6}, 0) = (0, 0)$



On your whiteboard...

$$3(y+1) + 1 = 2x + 4$$

$$3y + 3 + 1 = 2x + 4$$

$$\begin{array}{r} 3y + 4 = 2x + 4 \\ -4 \end{array}$$

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

$$\boxed{y = \frac{2}{3}x + 0}$$

y-intercept:

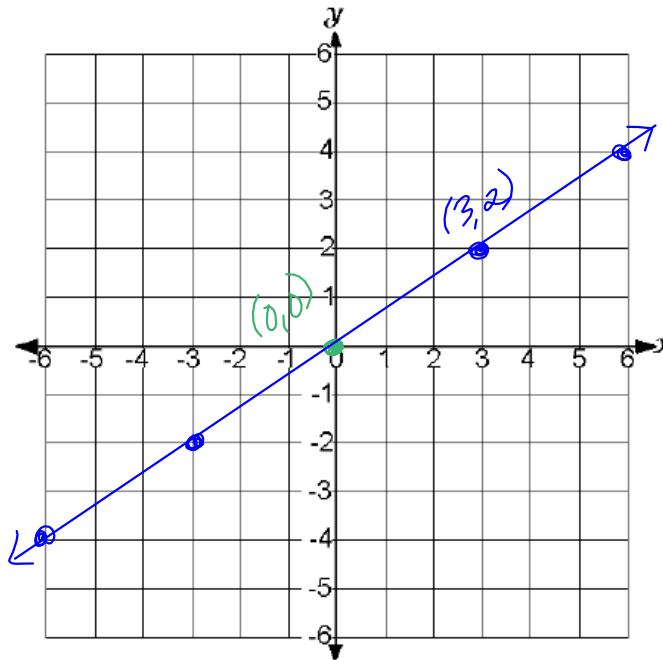
$$(0, 0)$$

Slope:

$$m = \frac{2}{3}$$

x-intercept:

$$(0, 0)$$



Example 4 Vertical and Horizontal Lines

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

only x

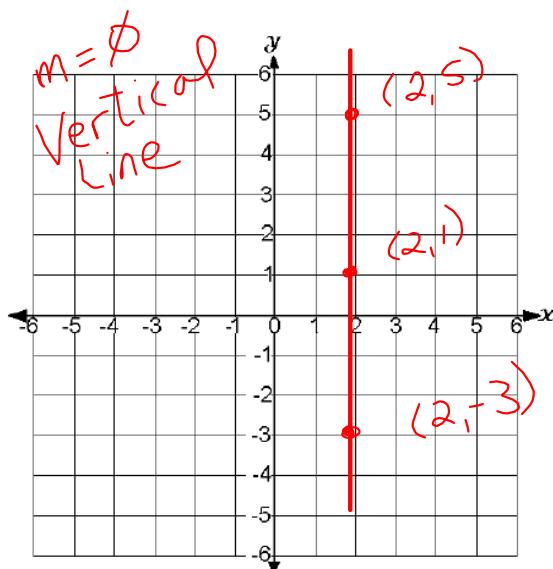
$$\begin{array}{r} 8 - 2x = 3x - 2 \\ \hline -3x \quad -3x \end{array}$$

$$\begin{array}{r} 8 - 5x = -2 \\ \hline -8 \quad -8 \end{array}$$

$$\begin{array}{r} -5x = -10 \\ \hline -5 \quad -5 \end{array}$$

$$x = 2$$

* All points on the graph with x-coordinate of 2.



only y

$$\begin{array}{r} 2y + 5 = -1 \\ \hline -5 \quad -5 \end{array}$$

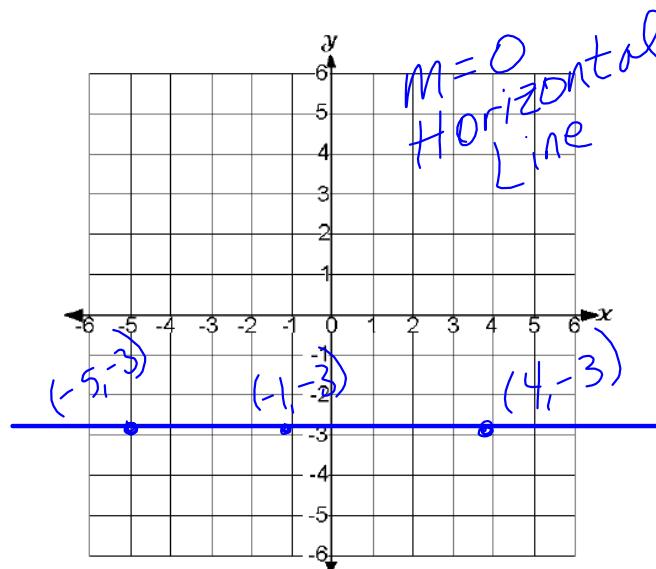
$$\frac{2y}{2} = \frac{-6}{2}$$

means

$$y = -3$$

$$y = 0x - 3$$

* All points on the graph with y-coordinate of -3.



On your whiteboard...

$$2(x - 3y) + 5 = -3(2y + 1)$$

$$\begin{array}{r} 2x - 6y + 5 = -6y - 3 \\ +6y \quad +6y \\ \hline 2x + 5 = -3 \end{array}$$

$$\begin{array}{r} -5 \quad -5 \\ \hline 2x = -8 \end{array}$$

$$x = -4$$

Vertical
Line

y-intercept:

none

Slope:

undefined

x-intercept:

(-4, 0)

