From RR 20

Note Title 2/5/2015

1) $y = 3x$

$x = 8$ | $y = 3(8) = 24$

$(8, 24)$

$x = 4$ | $y = 3(4)$

$y = 12$

$(4, 12)$

$x = -2$ | $y = 3(-2)$

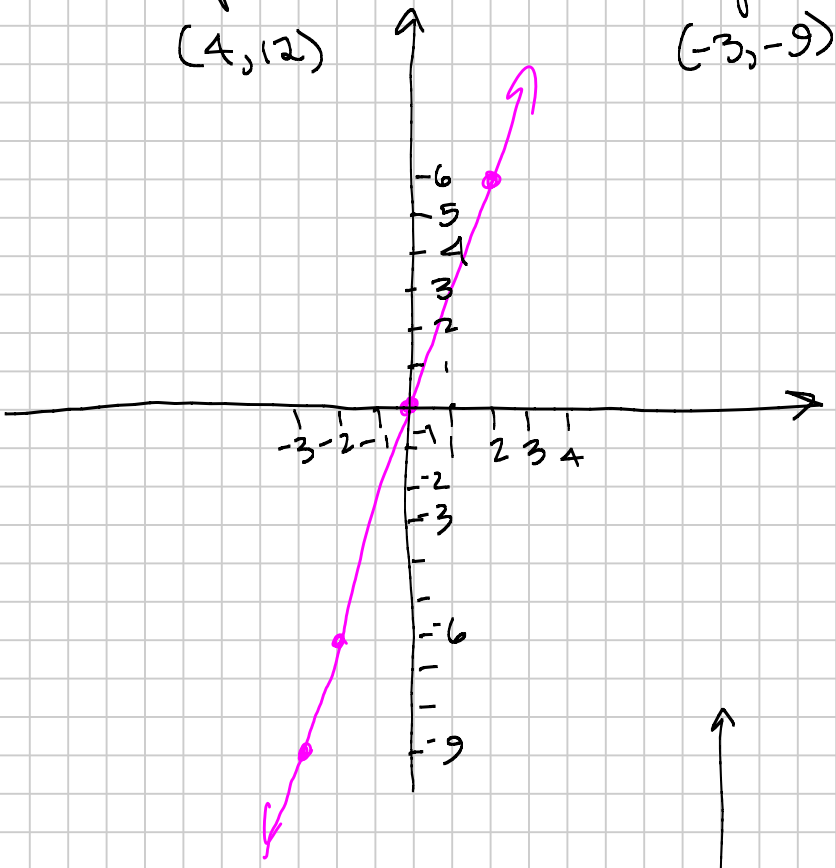
$y = -6$

$(-2, -6)$

$x = -3$ | $y = 3(-3)$

$y = -9$

$(-3, -9)$



Find x-intercept:

Set $y = 0$: $y = 3x$

$0 = 3x$

$\frac{0}{3} = \frac{3x}{3}$

$0 = x$

x-intercept: $(0, 0)$ or just 0

Find y-intercept:

Set $x = 0$ | $y = 3x$

$y = 3(0)$

$y = 0$

y-intercept: $(0, 0)$ or just 0

$x = 2$ | $y = 3(2)$

$y = 6$

$(2, 6)$

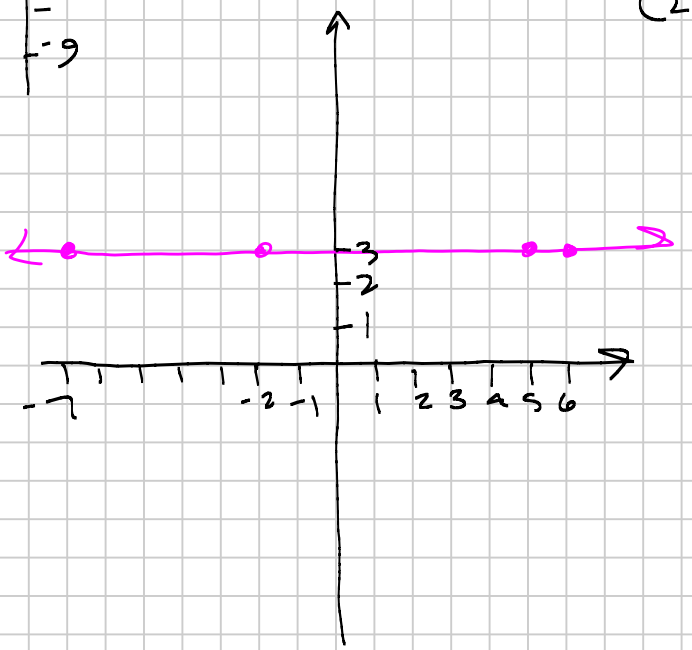
Ex: $y = 3$

$(6, 3)$

$(-7, 3)$

$(5, 3)$

$(-2, 3)$



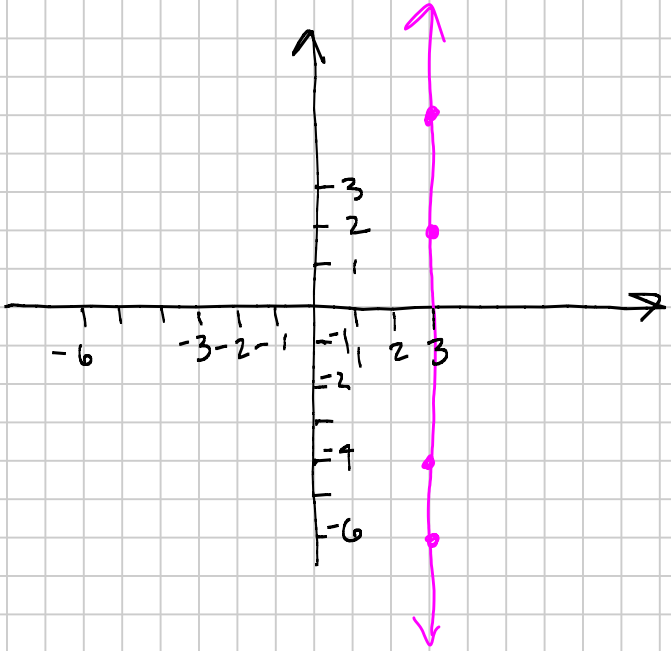
③ $x = 3$

(3, 5)

(3, 2)

(3, -6)

(3, -4)

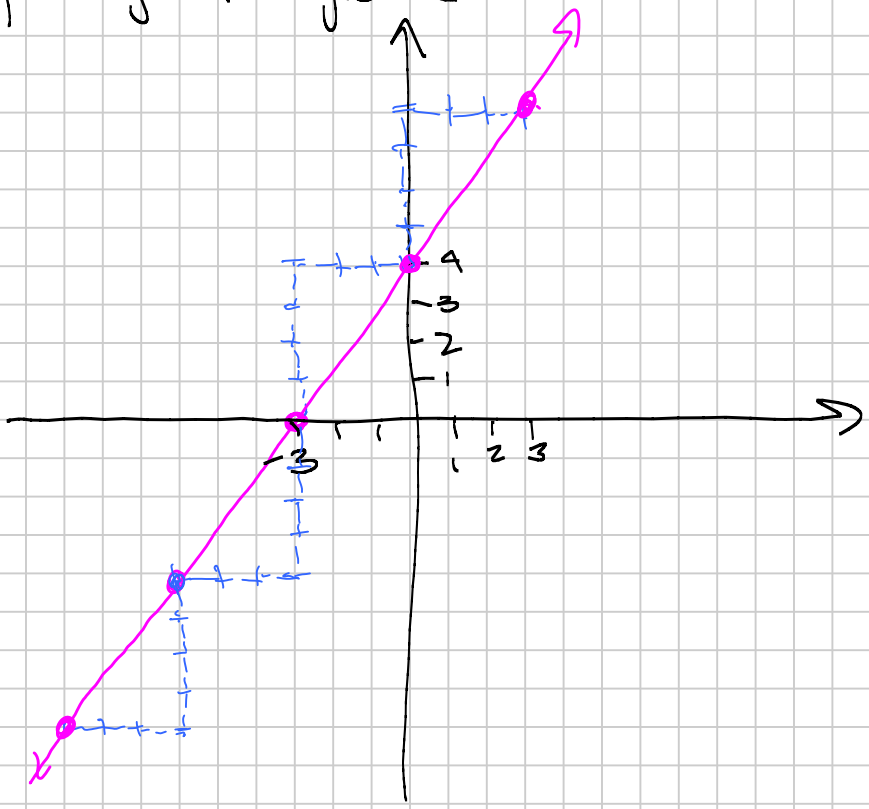


④ Graph the line passing through (-3, 0) with slope $\frac{4}{3}$.

Slope: $m = +\frac{4}{3} = \frac{\text{rise}}{\text{run}}$

Rise = vertical change: 4

Run = horizontal change: 3



3.3: The Slope of a Line (cont'd)

Definition: Slope of a line is $m = \frac{y_2 - y_1}{x_2 - x_1}$,

where (x_1, y_1) and (x_2, y_2) are any points on the line.

Ex: Find the slope of the line containing the points $(-3, 2)$ and $(5, 8)$.

Let $(x_1, y_1) = (-3, 2)$
$(x_2, y_2) = (5, 8)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-2}{5-(-3)} = \frac{6}{5+3} = \frac{6}{8} = \frac{3}{4}$$

Slope: $m = \frac{3}{4}$

Notice: If you switch the points, you get the same slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-8}{-3-5} = \frac{-6}{-8} = \frac{6}{8} = \frac{3}{4}$$

$(x_1, y_1) = (5, 8)$
$(x_2, y_2) = (3, 2)$

Ex: Find the slope of the line containing the points $(4, -6)$ and $(-1, -3)$.

x_1 y_1 x_2 y_2

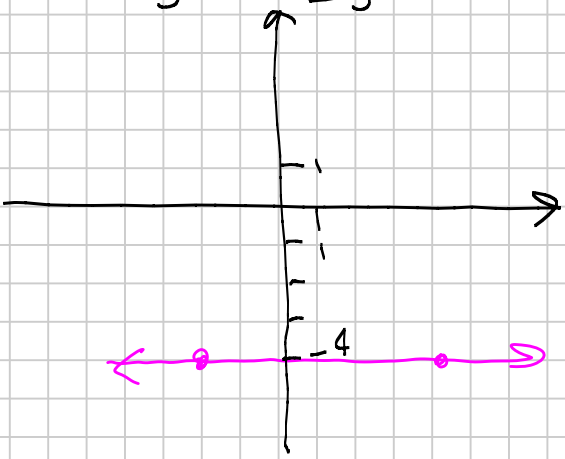
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-(-6)}{-1-4} = \frac{-3+6}{-5} = \frac{3}{-5} = -\frac{3}{5}$$

Slope: $m = -\frac{3}{5}$

Ex: Find slope of line containing $(3,-4)$ and $(-2,-4)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4-(-4)}{-2-3} = \frac{-4+4}{-5} = \frac{0}{-5} = 0$$

Slope is $m = 0$.



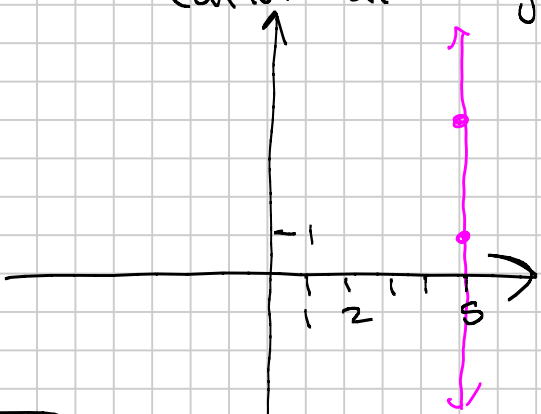
Ex: Find slope of line containing $(5,1)$ and $(5,3)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-1}{5-5} = \frac{2}{0}$$

undefined!

Cannot divide by 0!

The slope is undefined.



Important:

* Every horizontal line has slope 0
* Every vertical line has undefined slope.

Parallel and Perpendicular Lines

For 2 lines that are not horizontal or vertical:

* If 2 lines are parallel, their slopes are equal.

* If 2 lines are perpendicular, their slopes are opposite reciprocals.

Parallel:

Perpendicular

Ex: If a line has slope -3, then a line parallel to it has slope -3.

Ex: If a line has slope $-\frac{2}{3}$, then a line perpendicular to it has slope $\frac{3}{2}$.

3.4: Slope-intercept Form of a Linear Equation | 3.4.1

Standard Form of a Line: $Ax + By = C$ where A and B are not both 0.

Ex: $2x - 3y = -5$ is in standard form.

Slope-intercept Form of a Line: $y = mx + b$, where m is the slope and $(0, b)$ is the y-intercept.

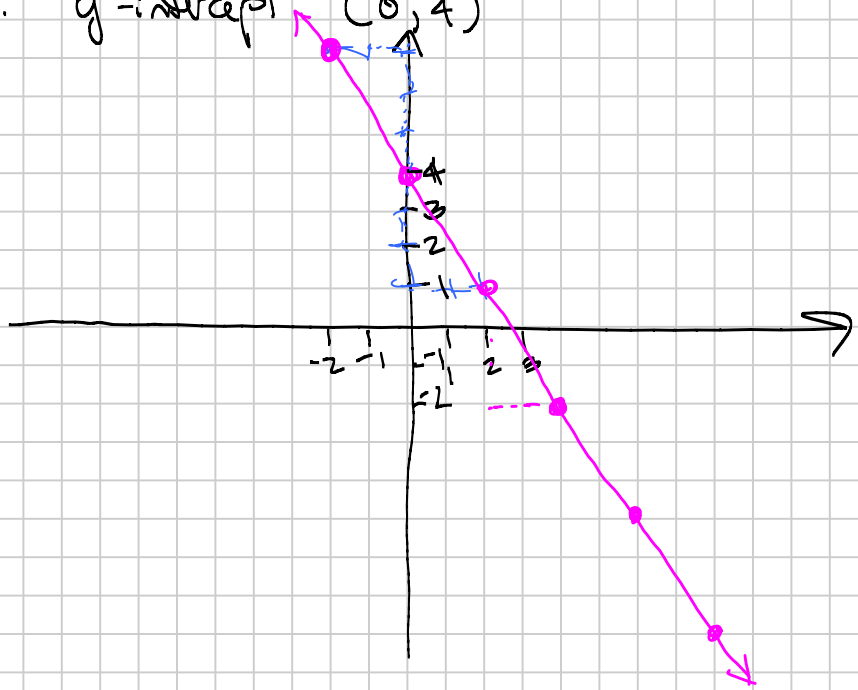
Ex: Graph the line $y = -\frac{3}{2}x + 4$.

$y = mx + b$

So $m = -\frac{3}{2}$ and $b = 4$.

So Slope is $m = -\frac{3}{2}$. y-intercept $(0, 4)$

$-\searrow$



3.4.2

EX: Write the equation of the line with slope 2 and y-intercept -3. Graph it.

Slope: $m = 2$
y-intercept: $-3 = b$

$y = mx + b$

$y = 2x - 3$ eqn of line

Slope: $m = 2 = +\frac{2}{1}$

y-intercept: $b = -3 \Rightarrow (0, -3)$