

Review Example from 3.3:Graph $2x - 3y = 15$ using intercepts.Find x-intercept: Set $y=0$: $2x - 3(0) = 15$

$$2x = 15$$

$$x = \frac{15}{2} = 7\frac{1}{2}$$

Ordered pair: $(7\frac{1}{2}, 0)$

x-intercept: $7\frac{1}{2}$

 or $(7\frac{1}{2}, 0)$ Find y-intercept: Set $x=0$: $2(0) - 3y = 15$

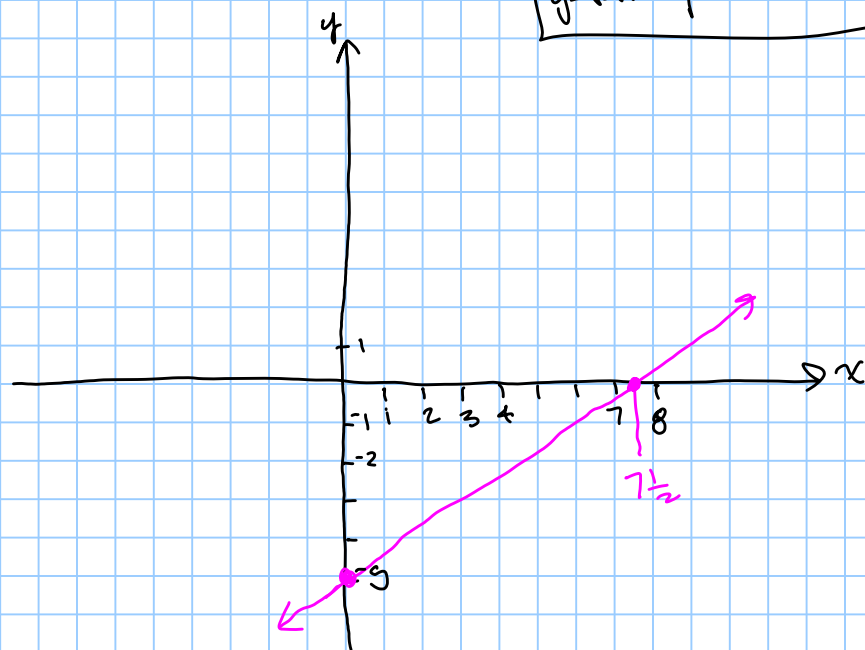
$$-3y = 15$$

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

$$y = -5$$

ordered pair $(0, -5)$

y-intercept: -5

 or $(0, -5)$ 

Ex: Graph $3y = -5x$. Find the intercepts.

(2)

Find x-intercept: Set $y=0$: $3(0) = -5x$

$$0 = -5x$$

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

$$0 = x$$

$(0, 0)$

x-intercept: 0

Find y-intercept: Set $x=0$: $3y = -5(0)$

$$3y = 0$$

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

$$y = 0$$

$(0, 0)$

y-intercept: 0

Need to find another point: $3y = -5x$

Solve for y: $\frac{3y}{3} = \frac{-5x}{3}$

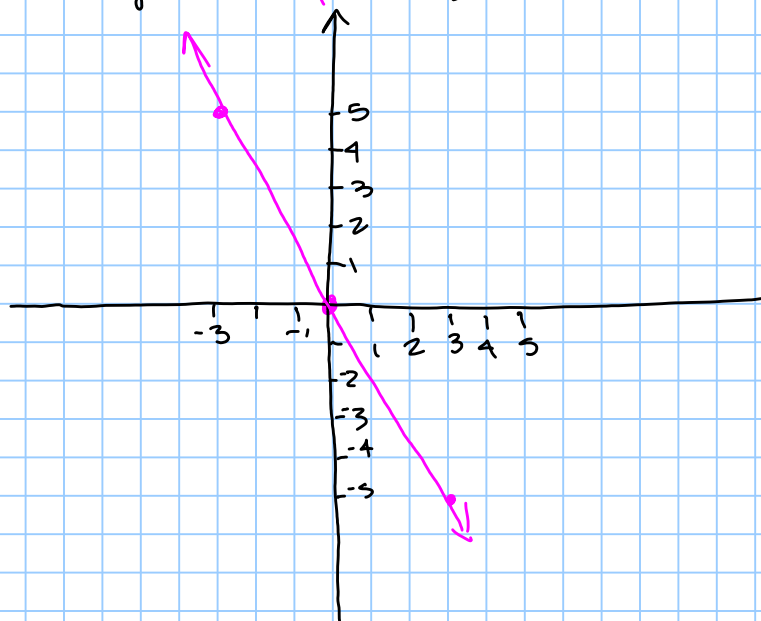
$$y = -\frac{5}{3}x$$

$$x=3 \Rightarrow y = -\frac{5}{3}(3) = -\frac{15}{3} = -5$$

$(3, -5)$

$$x=-3 \Rightarrow y = -\frac{5}{3}(-3) = \frac{15}{3} = 5$$

$(-3, 5)$

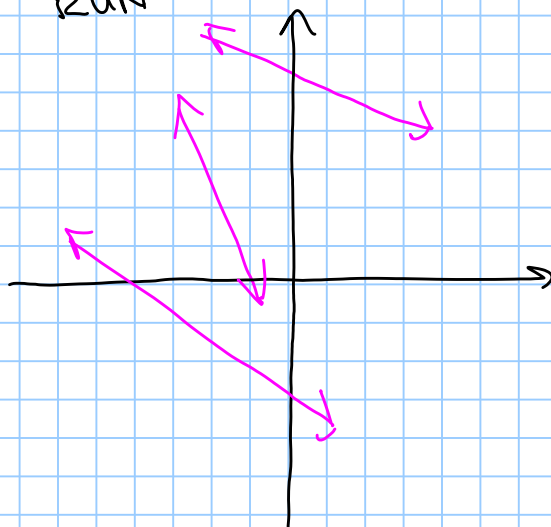
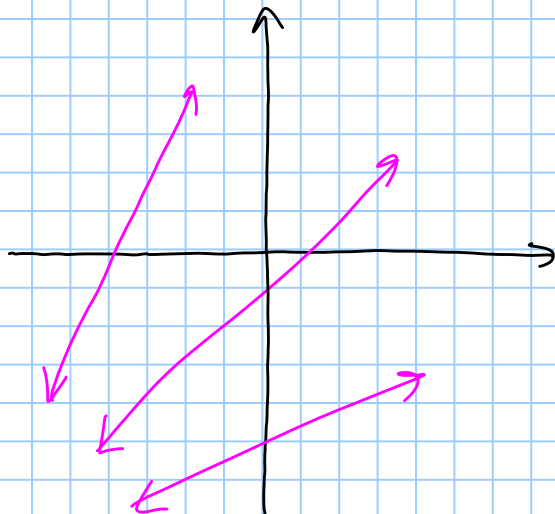


3.4: Graphing Linear Equations Using Slope

Slope: Measure of the "steepness" of a line.

Definition: Slope is $m = \frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are points on the line.

$$\text{Slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{RISE}}{\text{RUN}}$$

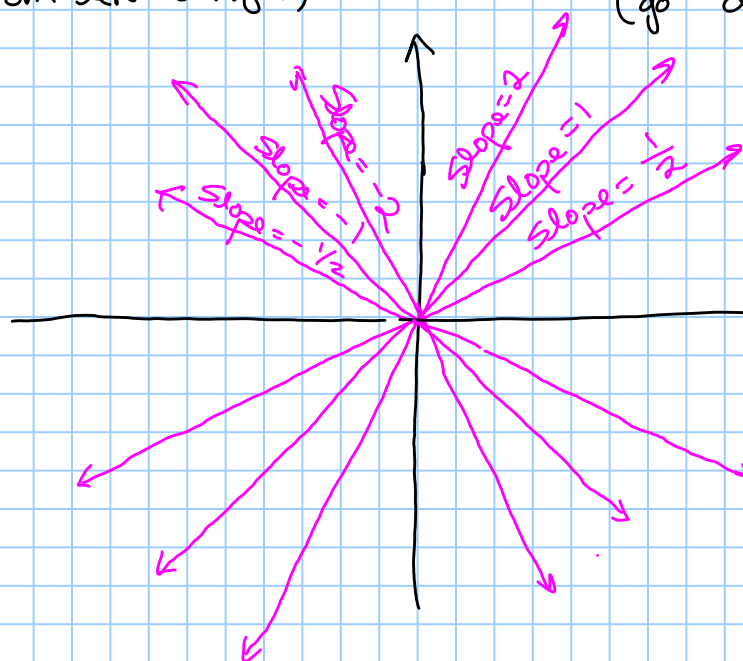


Positive Slopes

(go "uphill" from left to right)

Negative Slopes

(go "downhill" from left to right)



Note: $-1 > -2$

Ex. Find the slope of the line passing through (1, -2) and (-4, -6). Graph it. ④

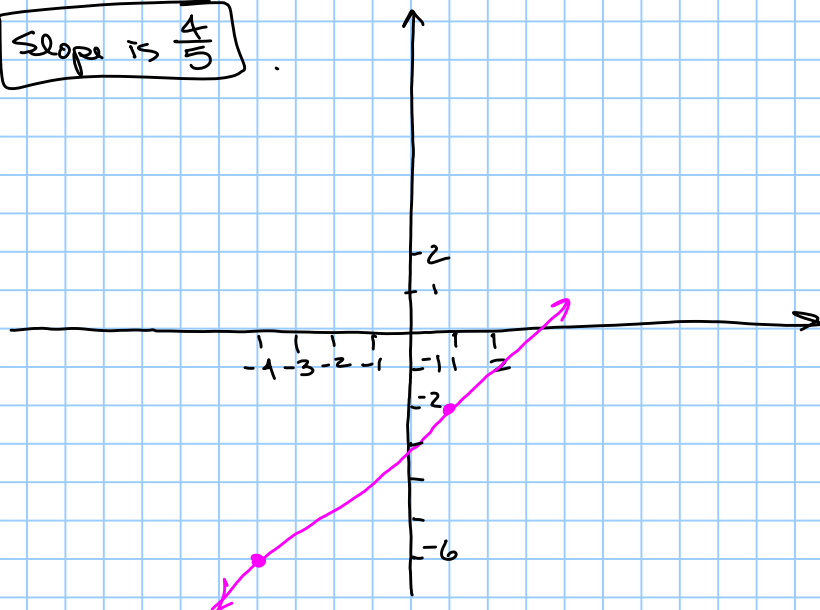
$$\text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1} \quad (\text{Definition of slope})$$

$$(x_1, y_1) = (1, -2)$$

$$(x_2, y_2) = (-4, -6)$$

$$m = \frac{-6 - (-2)}{-4 - 1} = \frac{-6 + 2}{-5} = \frac{-4}{-5} = \frac{4}{5}$$

Slope is $\frac{4}{5}$.



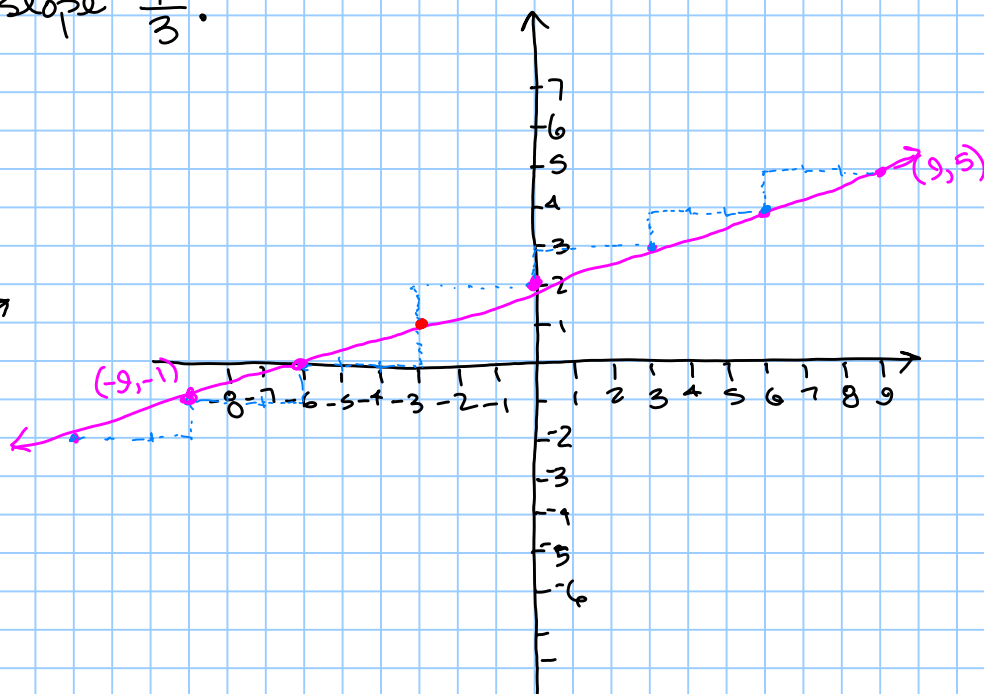
Ex. Graph the line that passes through (-3, 1) and has slope $\frac{1}{3}$.

$$\text{Slope: } m = +\frac{1}{3}$$

Positive Slope

$$\frac{\text{RISE}}{\text{RUN}} = \frac{1}{3}$$

vertical change: 1
horizontal change: 3



Ex: Graph the line that passes through $(4, -2)$ and has slope -3 .

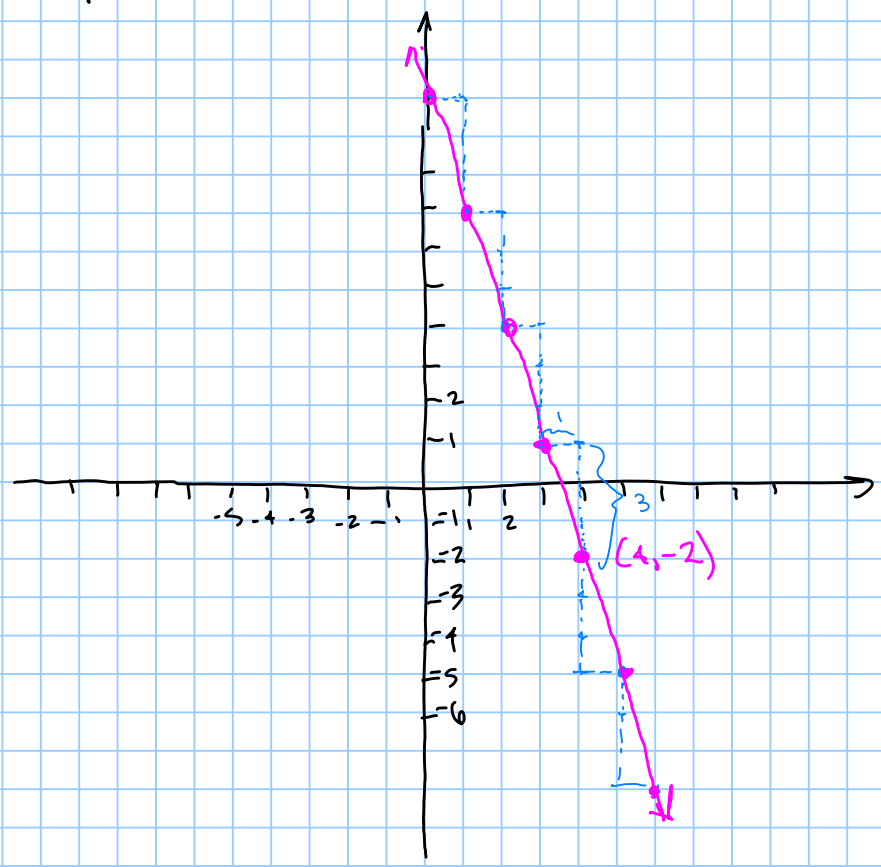
Point: $(4, -2)$

Slope: $m = -3 = -\frac{3}{1}$

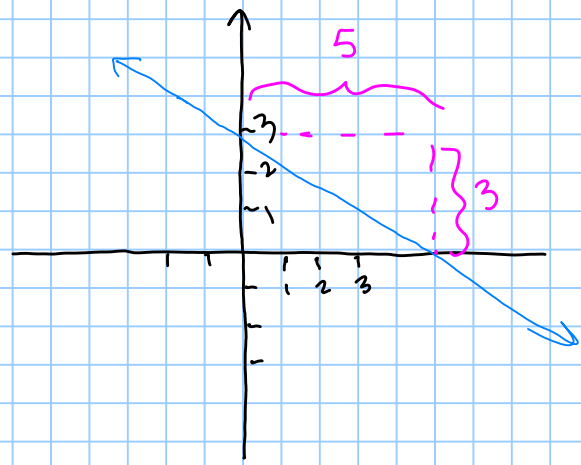
Slope: $\searrow$

$\frac{\text{RISE}}{\text{RUN}} = \frac{3}{1}$

vertical change: 3
horizontal change: 1



Ex: What is the slope of the line graphed below?



Look at points $(0, 3), (5, 0)$

vertical change: 3
horizontal change: 5

Is the slope positive or negative? ~~Negative~~
(goes downhill left to right)

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

The Slope-intercept Form of a Line (Sections 3.4 and 3.5)

The Slope-intercept form of a line is $y = mx + b$, where m is the slope and b is the y-intercept.

Example: Graph the line $y = -2x - 3$. (using slope) ⑥

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

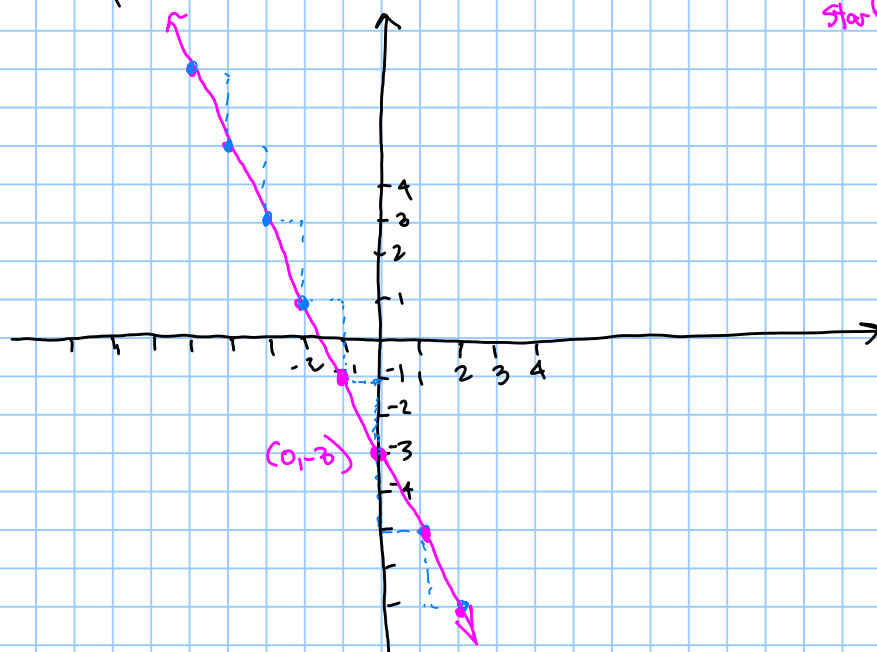
y-intercept: $b = -3$

→ use this as starting point.
starting point: $(0, -3)$

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

Vertical change: 2

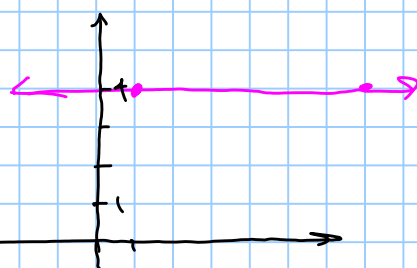
Horizontal change: 1



Ex: Calculate slope of line joining $(1, 4)$ and $(7, 4)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 4}{7 - 1} = \frac{0}{6} = 0$$

The slope of a horizontal line is 0.



Ex: Slope of line joining $(2, 3)$ and $(2, 5)$.

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

The slope of a vertical line is undefined.

