use when: we know some point of the model (not start) and rate of change.

Lesson 15 – Point-Slope Form

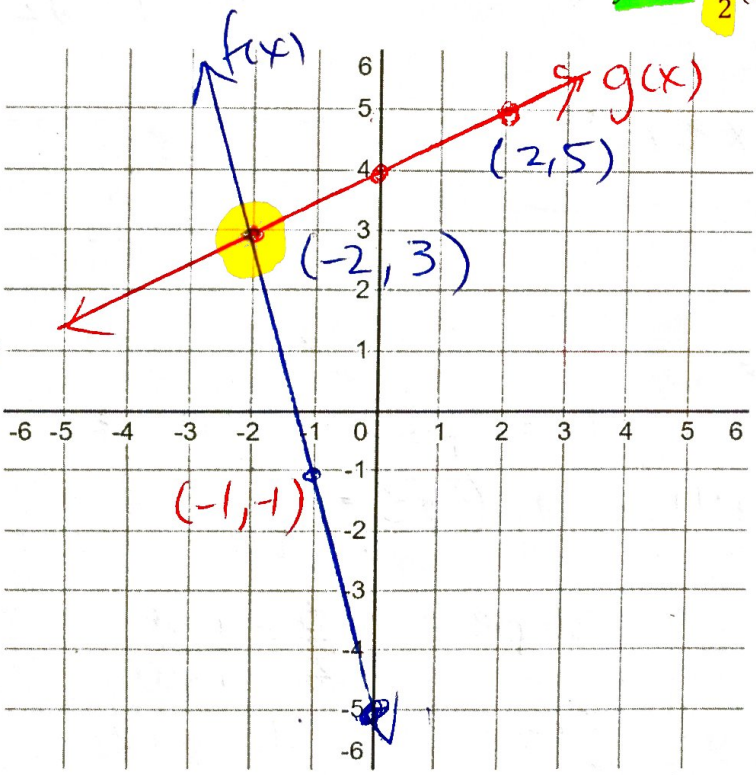
Goal:
• Can graph equations in point-slope form • Can build an equation for a linear function in point-slope form • Can use point-slope form to model applications
New Terminology:
• Point-slope form

Discuss: Graph the lines

we know slope intercept

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

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



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

$y-3 = -4x-8$

$+3 \quad +3$

$y = -4x - 5 = f(x)$

check let $x=-1$, $y=-1$

$-1-3 = -4(-1+2)$ ✓

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

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

$y = \frac{1}{2}x + 4 = g(x)$

check let $x=2$, $y=5$

$5-3 = \frac{1}{2}(2+2)$ ✓

What relationship do you notice about the equations and the graphs?

→ coefficient is telling us the direction of the line ⟹ this is the slope!

→ both pass through $(-2,3)$ and both have $(y-3)=0$ and $(x+2)=0$

$y = 3$ $\quad$ $x = -2$

The form these equations are written in is called **POINT-SLOPE FORM**, although this should really be called *slope form* as it is the definition of the slope.

$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$,

$m(x_2 - x_1) = y_2 - y_1$

$m(x - x_1) = y - y_1$

slope, x-coordinate, y-coordinate

the line passes through (x_1, y_1) and (x_2, y_2)

(x_1, y_1) ↑ stays constant and fixed

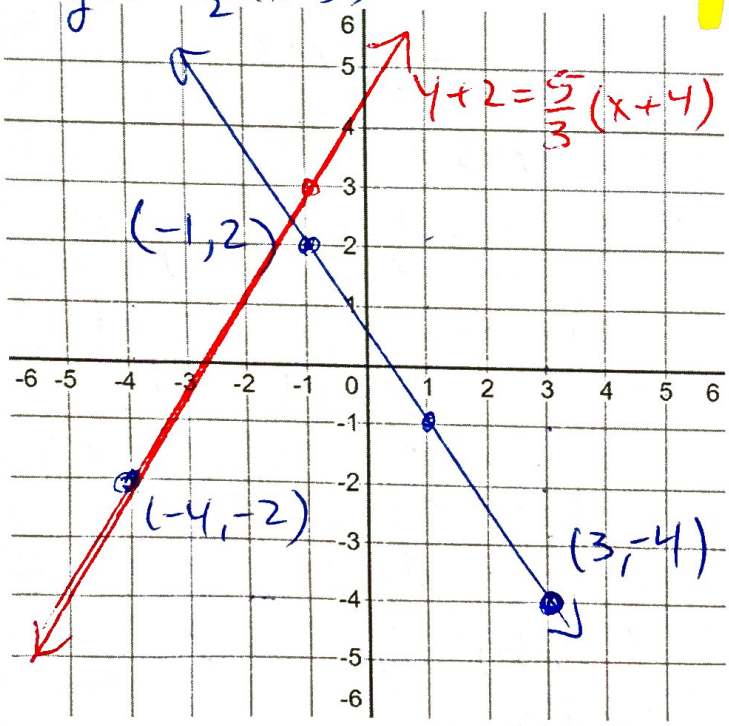
(x_2, y_2) ↑ is unknown

let $x = x_2$ and $y = y_2$

$$\boxed{y - y_1 = m(x - x_1)}$$

Example: Graph the following equation by identifying the point and slope.

$$y + 4 = -\frac{3}{2}(x - 3)$$



this passes through $(+3, -4)$

Slope $= \frac{-3}{2} = \frac{\text{rise}}{\text{run}}$

Check $x = -1$ $y = 2$

$2 + 4 = \frac{-3}{2}(-1 - 3)$ ✓

pass through $(-4, -2)$

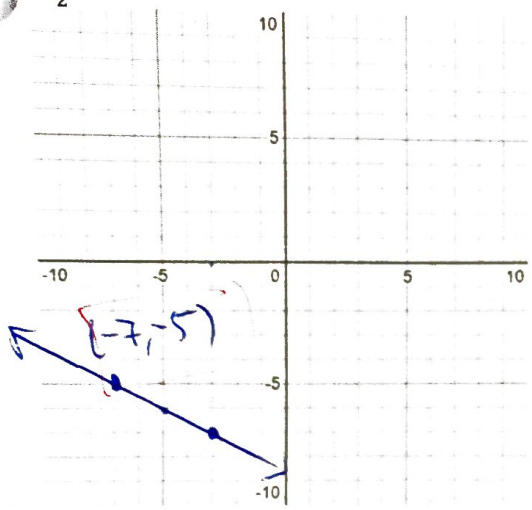
Check $x = -1$ $y = 3$

$3 + 2 = \frac{5}{3}(-1 + 4)$ ✓

Practice: Graph the following equation above and label the line.

$$y + 2 = \frac{5}{3}(x + 4)$$

Example: Determine the equation in point-slope form of the line that passes through the point $(-3,-7)$ and has slope $-\frac{1}{2}$.



$m = -\frac{1}{2}$ through $(-3,-7)$

x_1 y_1

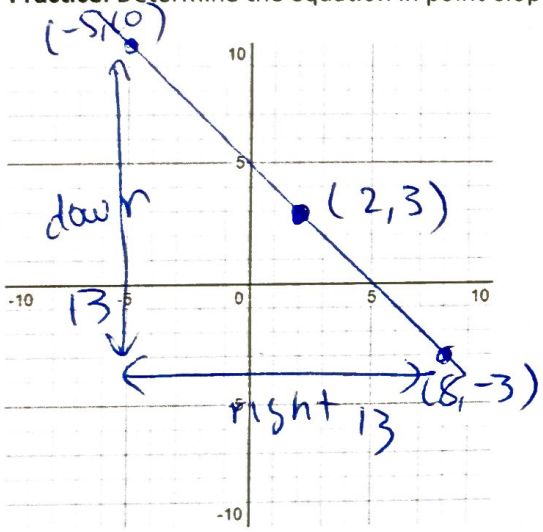
$y - y_1 = m(x - x_1)$

$y + 7 = -\frac{1}{2}(x + 3)$

$x = -7, y = -5$

$\Rightarrow -5 + 7 = -\frac{1}{2}(-7 + 3)$ ✓

Practice: Determine the equation in point-slope form of the line that passes through the points $(8,-3)$ and $(-5,10)$.



$m = \frac{-13}{13} = -1$

$y - y_1 = m(x - x_1)$

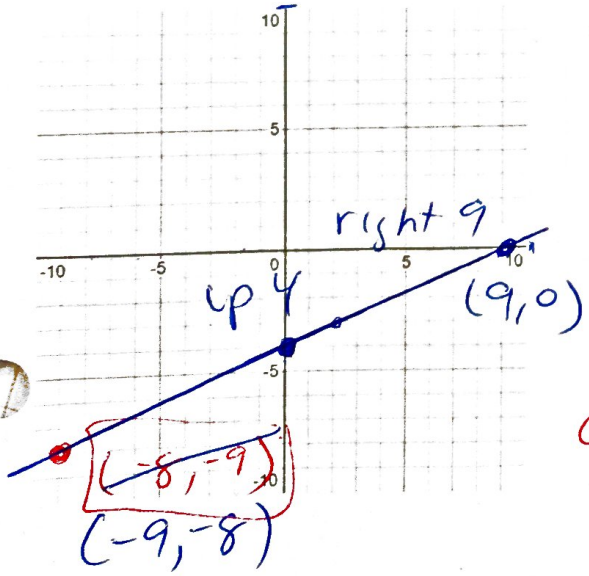
$y + 3 = -1(x - 8)$

$y = 3$ and $x = 2$

$3 + 3 = -1(2 - 8)$

✓

Practice: Determine the equation in point-slope form of the line that has an x-intercept of 9 and y-intercept of -4.



$m = \frac{+4}{+9} = \frac{4}{9}$

$y - y_1 = m(x - x_1)$

$y - 0 = \frac{4}{9}(x - 9)$

$y = \frac{4}{9}(x - 9)$ * in point slope form

check $x = -8$ $y = -9$

$-8 = \frac{4}{9}(-8 - 9)$ ✓

☆ use when: we don't know what we started with but can find the rate of change.

To determine the equation of a line we need 2 pieces of information:

1. 1 Point and Slope ⟹ (rate of change) easily make point-slope a little bit of work to make slope-intercept.
2. 2 Points ⟹ find rate of change first and then we have same information as above

We've looked at 3 ways to model linear equations. Each has advantages and disadvantages to be used. **Discuss** the pros and cons of each.

Form	Advantages	Disadvantages
Slope-Intercept $f(x) = mx + b$	→ can be written in function notation → id slope / y-intercept → easy to change to general → easy to graph	→ needs a well defined slope
General $Ax + By + C = 0$ $A \geq 0$	→ can solve for x or y [y=f(x) or x=g(y)] → can find intercepts → works with any slope → no fractions nice integers	→ does not show obvious characteristics
Point-Slope $y - y_0 = m(x - x_0)$	→ easy to graph → easy to id slope and a coordinate → easy to build the other two	→ needs a well defined slope → messy

Assigned Problems: 7.3 page 377 – 369 # 1-9, 11, 12, 14-17, 19, 22

18, 21

Key Ideas on page 376