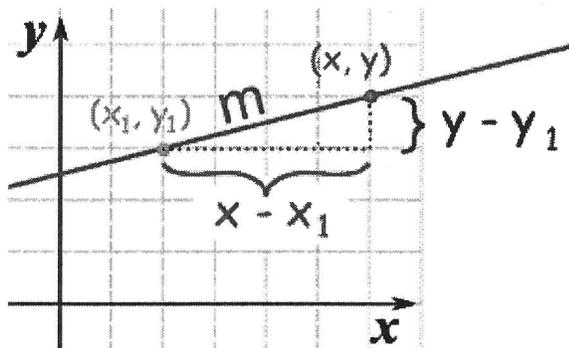## L37 – 73 Slope Point Form

Part 1 – Understanding Slope y-Point Form

Point-Slope Form

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

Slope

Ordered pair

Derivation:

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

$$\cdot (x_2 - x_1) \qquad \cdot (x_2 - x_1)$$

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

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

Slope Point Form:

It is called slope-point form because we need to things in order to write the equation:

1) . Slope $m = \frac{rise}{run}$ or $m = \frac{y_2 - y_1}{x_2 - x_1}$

2) . A point (x_1, y_1)

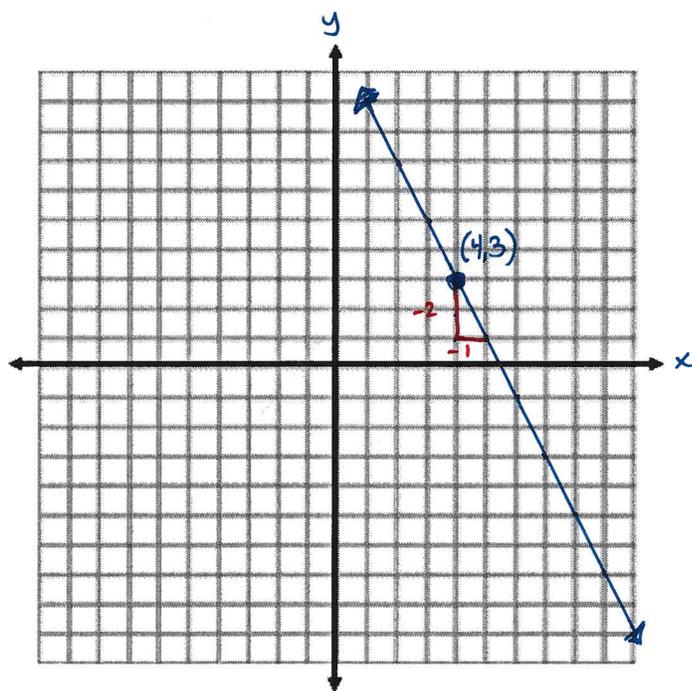### Part 2 – Slope y-Intercept Form in Colorado PhET Simulation

Colorado PhET – "Graphing Lines"

https://phet.colorado.edu/sims/html/graphing-lines/latest/graphing-lines_en.html

*Note that we will be spending an entire day using this simulation in **Lesson 40**.*

Math 10C

▮bEY▮

Q1: Use slope-point form to write an equation of the line through (4,3) with a slope of -2.

$$x_1 \ y_1 \qquad\qquad m$$

$$(y - y_1) = m(x - x_1)$$
$$(y - 3) = -2(x - 4)$$

Q2: Use slope-point form to write an equation of a line that passes through (5,-7) with a slope of 2/3.
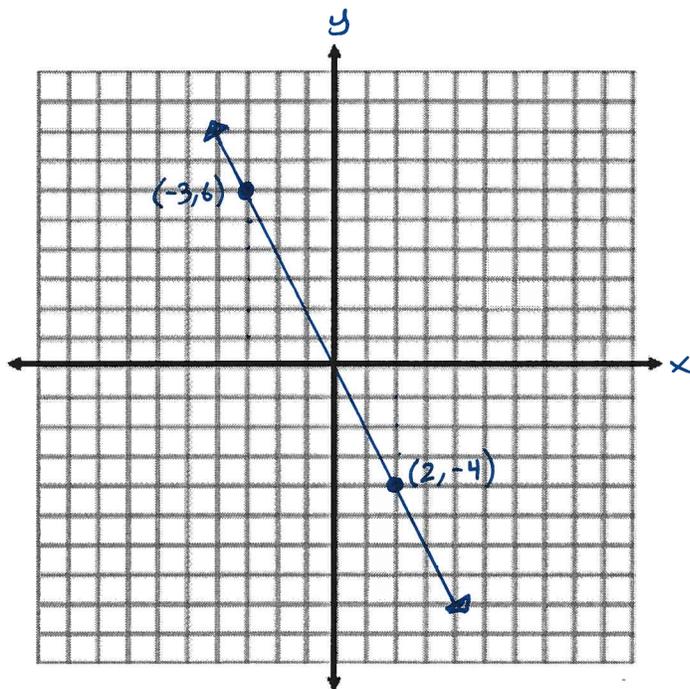
$$x_1 \ y_1 \qquad\qquad m$$
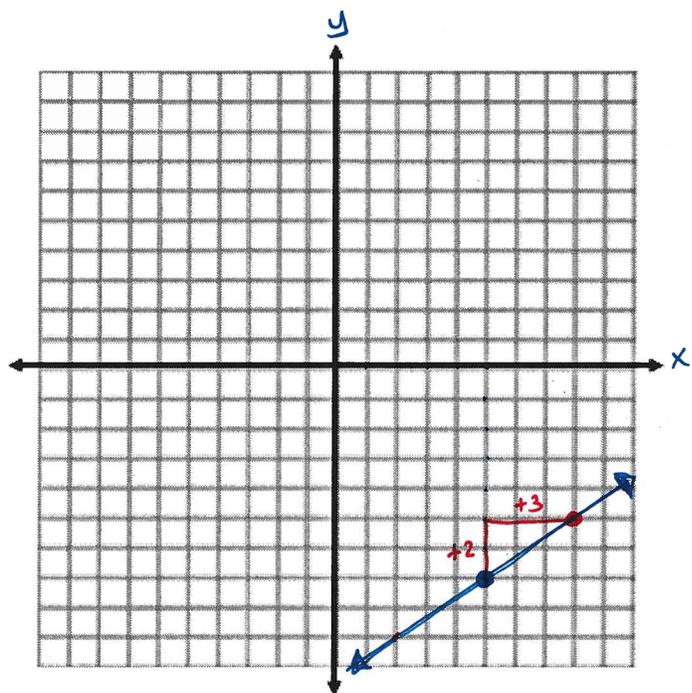
$$(y - y_1) = m(x - x_1)$$
$$(y - -7) = \frac{2}{3}(x - 5)$$
$$\Downarrow$$
$$(y + 7) = \frac{2}{3}(x - 5)$$

Q3: Use slope-point form to write an equation of a line that passes through (2,-4) and (-3,6).

$$\overset{x_1 \; y_1}{} \qquad \overset{x_2 \; y_2}{}$$

① Need a slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-4)}{-3 - 2} = \frac{10}{-5}$$

$$\boxed{m = -2}$$

② Need a point.

Option #1: Use $(\overset{x_1}{2}, \overset{y_1}{-4})$

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

Option #2: Use $(\overset{x_1}{-3}, \overset{y_1}{6})$

$$(y - 6) = -2(x - -3)$$
$$\boxed{(y - 6) = -2(x + 3)}$$

- Both are valid options.
- Both equations correctly describe the line.

Q4: The line $(y - 5) = 4(x + 3)$ passes through the point

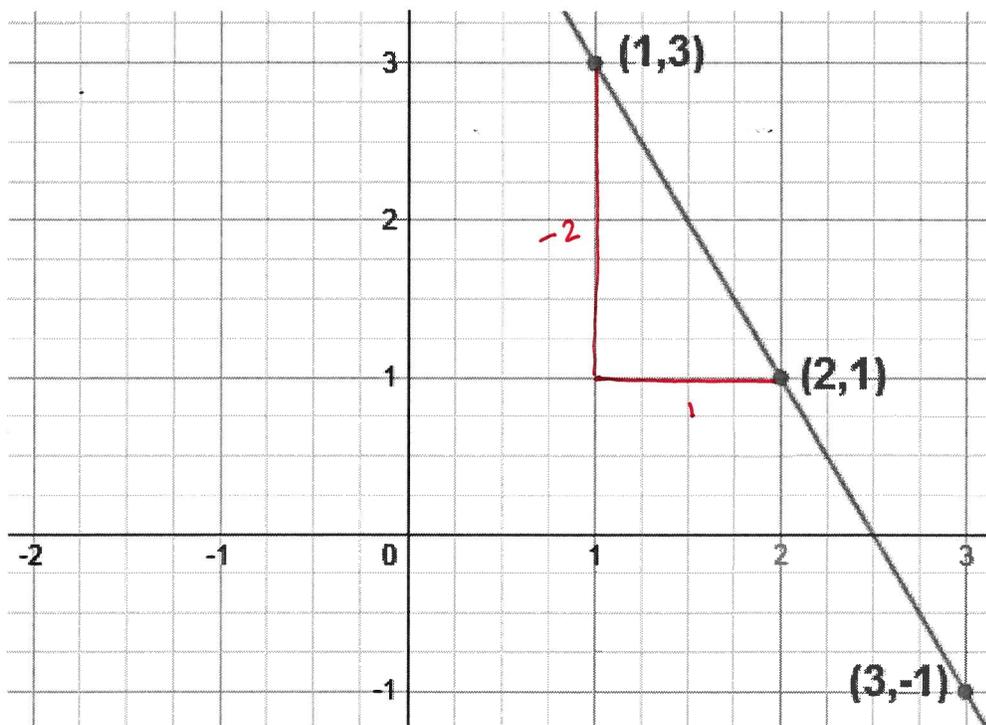   a. (3,5)
   b. (-3,5)
   c. (3,-5)
   d. (-3,-5)

$$(y - y_1) = m(x - x_1)$$
$$(y - \underline{5}) = 4(x - \underline{-3})$$

So point (x, y) is $(-3, 5)$

KEY

Part 4 – Equations from a Graph

Q5: Write the equation of the graph:

$m = \dfrac{rise}{run} = \dfrac{-2}{1}$

$\boxed{m = -2}$

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

Option #1: Use $(\overset{x_1}{1}, \overset{y_1}{3})$

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

Option #2: Use $(\overset{x_1}{2}, \overset{y_1}{1})$

$(y - 1) = -2(x - 2)$

Option #3: Use $(\overset{x_1}{3}, \overset{y_1}{-1})$

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

$\Downarrow$

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

heY

Part 6 – Changing the Form of an Equation

Solve equation for y

1. Bring all variables onto the same side.
2. Multiply to remove fractions.
3. Make "A" positive.

Slope Point $(y-y_1) = m(x-x_1)$	Slope y-Intercept $y=mx +b$	General Form $Ax+By+C=0$

Remember that "b" is really $(0, b)$

Solve equation for y
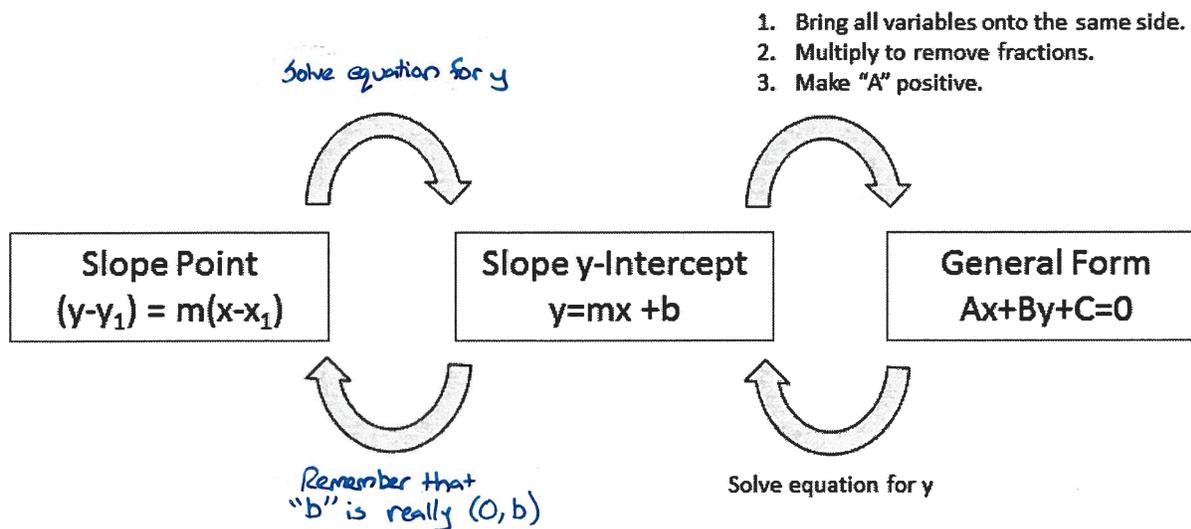
Q6: Rewrite the slope-point equation in slope y-intercept form and general form.

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

$$y - 2 = -4x - 12$$
$$+2 \qquad\qquad +2$$

$$\boxed{y = -4x - 10}\ \text{Slope y-intercept form}$$

$$y = -4x - 10$$
$$+4x \qquad\quad +4x$$

$$4x + 1y = -10$$
$$+10 \qquad +10$$

$$\boxed{4x + 1y + 10 = 0}\ \text{General Form}$$

■ KEY ■

Q7: Rewrite the general equation in slope y-intercept form and slope-point form.

$2x + 3y - 9 = 0$

$-2x \qquad\qquad -2x$

$3y - 9 = -2x$

$+9 \qquad +9$

$3y = -2x + 9$

$\div 3 \quad \div 3 \quad \div 3$

$\boxed{y = -\frac{2}{3}x + 3}$ Slope y-intercept form

Using $m = -\frac{2}{3}$
and point $(0, 3)$

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

$\boxed{(y - 3) = -\frac{2}{3}(x - 0)}$

Slope Point Form

Q8: Rewrite the slope y-intercept equation in general form and slope-point form.

$y = \dfrac{5}{2}x - 1 \qquad\Longrightarrow$

$\Downarrow$

$y = \frac{5}{2}x - 1$

$-y \qquad -y$

$0 = \frac{5}{2}x - 1y - 1$

$\times 2 \quad \times 2 \quad \times 2 \quad \times 2$

$0 = 5x - 2y - 2$

$\boxed{5x - 2y - 2 = 0}$ General Form

Use $m = \frac{5}{2}$ and point $\overset{x_1 \ y_1}{(0, -1)}$

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

$(y - -1) = \frac{5}{2}(x - 0)$

$\Downarrow$

$\boxed{(y + 1) = \frac{5}{2}(x - 0)}$

Part 6 – Textbook Practice

Pg. 377 #1-3, 6 (complete half), 7, 14, 15