MTH1W – Analytic Geometry　　　　　　　　　　　Name: _Mr. Hayes_

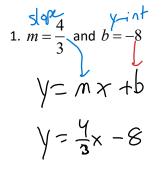**Lesson 8.2: Creating Equations of Lines**　　　　　Date: _May 11, 2023_

Learning Goal: We are learning to write the equation of a line without using a graph.

Recall that the slope intercept form is $y = mx + b$, where m is the slope of the line and b is the y-intercept. In today's lesson, we are going to focus on creating the equation of a line given various pieces of information.

Here are the steps:

1. Are you given slope? If yes, move to step 3. If no, do step 2.
2. Calculate the slope using the slope formula.
3. Do you have the y-intercept, meaning **b** or **(0,#)**? If yes, insert the **m** and **b** into $y = mx + b$ then done! If no, next step.
4. Calculate the **b** by rearranging $y = mx + b$ to $b = -mx + y$, then plug in a point and the slope.

slope　　　　point (x, y)

For all the following examples, create $y = mx + b$.

1. $m = \dfrac{4}{3}$ (slope) and $b = -8$ (y-int)

$$y = mx + b$$

$$y = \frac{4}{3}x - 8$$

2. $m = 5$ (slope) and $(-2, 3)$ (just a point)

$b = ?$　　　x　y

$b = -mx + y$

$b = -(5)(-2) + 3$

$b = 10 + 3$

$b = 13$

$$\therefore y = 5x + 13$$

3. $m = \dfrac{-3}{5}$ (slope) and $(10, 6)$ (x, y)

$b = -mx + y$

$b = -\left(\dfrac{-3}{5}\right)(10) + 6$

$b = 6 + 6$

$b = 12$ ✓

$$\therefore y = \frac{-3}{5}x + 12$$

1 - ⇒ -
2 - ⇒ +
3 - ⇒ -

3 × 10 ÷ 5

4. $m = -7$ and $(0, 5)$ (x, b)

$$\therefore y = -7x + 5$$

$b = -mx + y$

$b = -(-7)(0) + 5$

$b = 5$

$m = ?$ $b = ?$

5. $(-3,3)$ and $(-2,5)$ 6. $(-4,5)$ and $(5,2)$

① $m = \dfrac{Y_2 - Y_1}{X_2 - X_1} = \dfrac{5-3}{-2-(-3)} = \dfrac{2}{1} = 2$ ✓   ① $m = \dfrac{-3}{9} = \dfrac{-1}{3}$

② $b = -mx + y$ use $(-2,5)$ ② $b = -mx + y$ use $(5,2)$

$b = -(2)(-2) + 5$ $b = -\left(\dfrac{-1}{3}\right)(5) + 2$

$b = 4 + 5$ $b = 1.7 + 2$

$b = 9$ ✓ $b = 3.7$

$\therefore y = 2x + 9$ $\therefore y = \dfrac{-1}{3}x + 3.7$

7. Create the equation of a line which has the same slope as $4x - 5y = -5$ and has the same y-intercept as $3y + 5x - 9 = 0$.

① Get slope from: ② Get the b from:

$4x - 5y = -5$ $3y + 5x - 9 = 0$ $\therefore y = \dfrac{4}{5}x + 3$

$\dfrac{4x}{5} + \dfrac{5}{5} = \dfrac{5y}{5}$ $\dfrac{3y}{3} = \dfrac{-5x}{3} + \dfrac{9}{3}$

$\dfrac{4}{5}x + 1 = y$ $m = \dfrac{4}{5}$ $y = \dfrac{-5}{3}x + 3$ $b = 3$

8. Create the equation of a line which has the same slope as $8 - 3y = 7x$ and passes through the point $(4,-5)$.

① Get slope from: ② $b = -mx + y$ $\therefore y = \dfrac{-7}{3}x + 4.3$

$+8 - 3y = 7x$ $b = -\left(\dfrac{-7}{3}\right)(4) - 5$

$\dfrac{-7x}{3} + \dfrac{8}{3} = \dfrac{3y}{3}$ $b = 9.3 - 5$

$m = \dfrac{-7}{3}$ $b = 4.3$

Success Criteria:
- I can write the equation of a line if I am given the slope and the y-intercept
- I can use the slope-intercept form to create the equation of a line.