MTH1W – Analytic Geometry

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Lesson 7.2: Creating Equations of Lines

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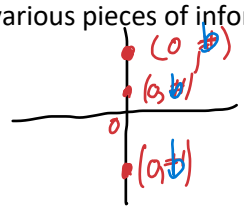
Learning Goal: We are learning to write the equation of a line without using a graph.

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.

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

1. $m = \frac{4}{3}$ and $b = -8$

$y = mx + b$

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

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

$b = -mx + y$

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

$b = 10 + 3$

$b = 13$

$\therefore y = 5x + 13$

3. $m = \frac{-3}{5}$ and $(10, 6)$

$b = -mx + y$

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

3 ÷ 5 × 10

$b = 6 + 6$

$b = 12$

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

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

$y = -7x + 5$

$b = -mx + y$

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

m = ? b = ?

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

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

② $b = -mx + y$ use $(-2,5)$

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

$b = 4 + 5$

$b = 9$

③ $y = 2x + 9$

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

① $m = \frac{-3}{9} = -\frac{1}{3}$

② $b = -mx + y$ use $(5,2)$

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

$b = -1.7 + 2$

$b = 0.3$

③ $y = -\frac{1}{3}x + 0.3$

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 need slope from:

$4x - 5y = -5$

$\frac{4x}{5} + \frac{5}{5} = \frac{5y}{5}$

$\frac{4}{5}x + 1 = y$

$m = \frac{4}{5}$

② need the b from:

$3y + 5x - 9 = 0$

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

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

$b = 3$

$\therefore y = \frac{4}{5}x + 3$

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

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.