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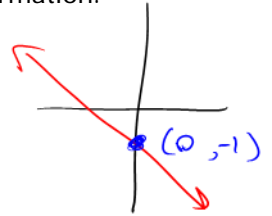
For all the following examples, create $y = mx + b$.

$(0, -1)$

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

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

2. $m = -7$ and $(0,5)$ the y-int

∴ $b = 5$

$$y = -7x + 5$$

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

$$y = mx + b$$
$$6 = \tfrac{-3}{5}(\tfrac{10}{1}) + b \quad \boxed{12 = b}$$
$$6 = \tfrac{-30}{5} + b$$
$$6 \overset{+6}{=} -6 \overset{+6}{+} b$$

∴ $y = \tfrac{-3}{5}x + 12$

4. $m = \dfrac{2}{7}$ and $\overset{x \ \ y}{(-2,3)}$

$$y = mx + b$$
$$3 = \tfrac{2}{7}(\tfrac{-2}{1}) + b$$
$$3 = \boxed{\tfrac{-4}{7}} + b$$
$$\tfrac{3 \times 7}{1 \times 7} + \tfrac{4}{7} = b$$
$$\tfrac{21}{7} + \tfrac{4}{7} = b$$
$$\tfrac{25}{7} = b$$

∴ $y = \tfrac{2}{7}x + \tfrac{25}{7}$

5. $\overset{x_1 \ y_1}{(-3,3)}$ and $\overset{x_2 \ y_2}{(-2,5)}$

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

② use $m = 2$ and $\overset{x \ \ y}{(-2, 5)}$

$$y = mx + b$$
$$5 = 2(-2) + b$$
$$5 \overset{+4}{=} -4 \overset{+4}{+} b$$
$$\boxed{9 = b}$$

∴ $y = 2x + 9$

6. $\overset{x_1 \ y_1}{(-4,5)}$ and $\overset{x_2 \ y_2}{(5,2)}$

① $m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{2-5}{5-(-4)} = \dfrac{-3}{9} = \boxed{\tfrac{-1}{3}}$

② use $m = \tfrac{-1}{3}$ and $(-4, 5)$

$$y = mx + b$$
$$5 = \tfrac{-1}{3}(\tfrac{-4}{1}) + b$$
$$5 = \boxed{\tfrac{4}{3}} + b$$
$$\tfrac{5 \times 3}{1 \times 3} - \tfrac{4}{3} = b$$
$$\tfrac{15}{3} - \tfrac{4}{3} = b$$
$$\boxed{\tfrac{11}{3} = b}$$

$$y = \tfrac{-1}{3}x + \tfrac{11}{3}$$

$\Rightarrow y = mx + b$

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 $4x - 5y = -5$

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

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

∴ $m = \frac{4}{5}$

② need the "b" from $3y + 5x - 9 = 0$

③ ∴ $y = \frac{4}{5}x + 3$

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

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

∴ $b = 3$

8. Create the equation of a line which has the same slope as $8 - 3y = 7x$ and has the same y-intercept as $5x + 2y = 3$.

① Need slope from $8 - 3y = 7x$

$\frac{-7x}{3} + \frac{8}{3} = \frac{3y}{3}$

$y = \frac{-7}{3}x + \frac{8}{3}$

∴ $m = \frac{-7}{3}$

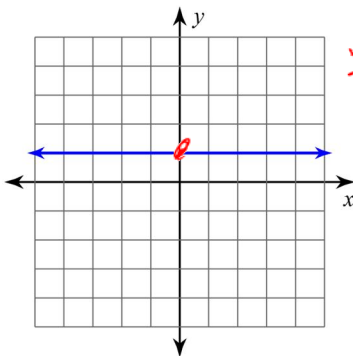② need "b" from $5x + 2y = 3$

③ ∴ $y = \frac{-7}{3}x + \frac{3}{2}$

$\frac{2y}{2} = \frac{-5x}{2} + \frac{3}{2}$

$y = \frac{-5}{2}x + \frac{3}{2}$

∴ $b = \frac{3}{2}$

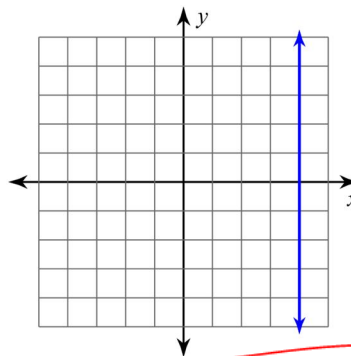**Horizontal and Vertical Lines:** Given the graph, determine the equation of the line:

Special Cases ★ Memorize.

a)

$m = 0$, $b = 1$

$y = 0x + 1$

$y = 1$

b)

$x = 4$

$m = $ undefined

$b = $ none