ACMAT117 Fall 2024
Professor Manguba-Glover
Section 2.1 Classwork (CW 4) Name: _____

Complete as many of the following problems as you can with your group. You do not have to go in order. Each group will be given a specific problem that they must complete and present to either Professor MG or to Stefanie before they leave.

If **your entire table** finishes early, and you have presented your given problem, you may leave early.

(1) Find the slope and y-intercept of the graph and use it to graph the following functions:

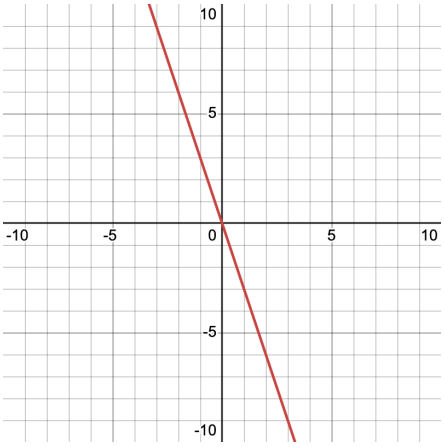
(a) $f(x) = -3x$

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

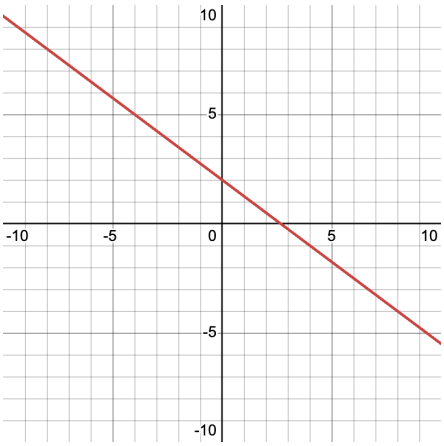
(c) $y = \frac{2}{3}x - 4$

Solution In the form $y = mx + b$, m is the slope and b is the y-intercept

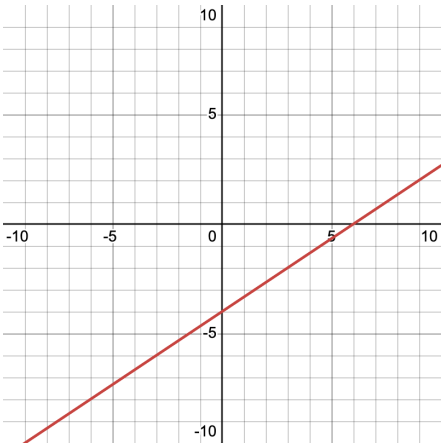
(a) $m = -3$, $b = 0$



(b) $m = -\frac{3}{4}$, $b = 2$



(c) $m = \frac{2}{3}$, $b = -4$



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(2) Find the x and y intercepts and then use them to graph the following:

(a) $5x = 10y - 20$

(b) $-6x + 4y = 0$

(c) $3x - 4y = -12$

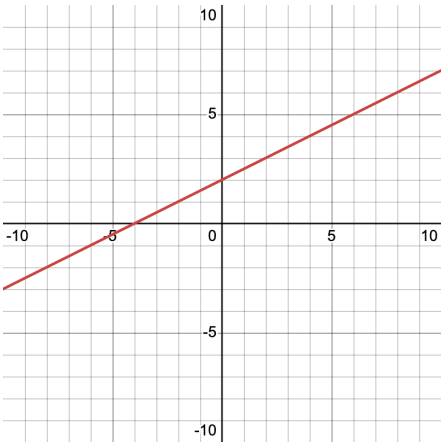
(d) $f(x) = -\frac{2}{3}x + 2$

Solution To find x-intercepts, set $y = 0$ and solve. To find y-intercepts, set $x = 0$ and solve.

(a)

$$\begin{aligned} 5x = 10(0) - 20 &\Leftrightarrow 5x = 0 - 20 \\ &\Leftrightarrow 5x = -20 \\ &\Leftrightarrow \boxed{x = -4 \text{ or } (-4, 0)} \end{aligned}$$

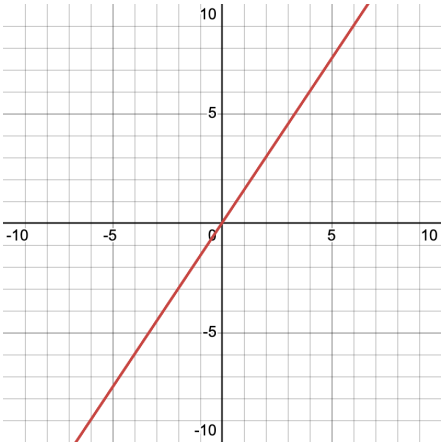
$$\begin{aligned} 5(0) = 10y - 20 &\Leftrightarrow 0 = 10y - 20 \\ &\Leftrightarrow 20 = 10y \\ &\Leftrightarrow \boxed{y = 2 \text{ or } (0, 2)} \end{aligned}$$



(b)

$$\begin{aligned} -6x + 4(0) = 0 &\Leftrightarrow -6x + 0 = 0 \\ &\Leftrightarrow -6x = 0 \\ &\Leftrightarrow \boxed{x = 0 \text{ or } (0,0)} \end{aligned}$$

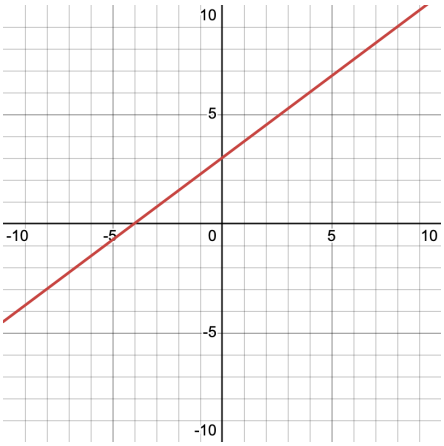
$$\begin{aligned} -6(0) + 4y = 0 &\Leftrightarrow 0 + 4y = 0 \\ &\Leftrightarrow 4y = 0 \\ &\Leftrightarrow \boxed{y = 0 \text{ or } (0,0)} \end{aligned}$$



(c)

$$\begin{aligned} 3x - 4(0) = -12 &\Leftrightarrow 3x - 0 = -12 \\ &\Leftrightarrow 3x = -12 \\ &\Leftrightarrow \boxed{x = -4 \text{ or } (-4,0)} \end{aligned}$$

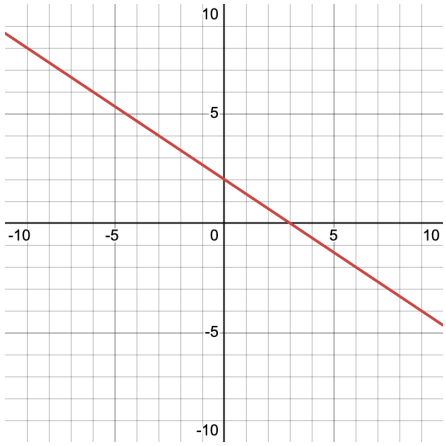
$$\begin{aligned} 3(0) - 4y = -12 &\Leftrightarrow 0 - 4y = -12 \\ &\Leftrightarrow -4x = -12 \\ &\Leftrightarrow \boxed{x = 3 \text{ or } (3,0)} \end{aligned}$$



(d)

$$0 = -\frac{2}{3}x + 2 \Leftrightarrow \frac{2}{3}x = 2$$
$$\Leftrightarrow x = 2 \cdot \frac{3}{2}$$
$$\Leftrightarrow \boxed{x = 3 \text{ or } (3, 0)}$$

$$y = -\frac{2}{3}(0) + 2 \Leftrightarrow y = 0 + 2$$
$$\Leftrightarrow \boxed{y = 2 \text{ or } (0, 2)}$$



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(3) Rewrite the given equation in slope-intercept form, and then graph the function.

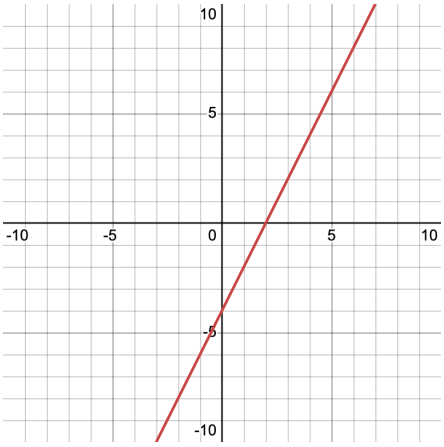
(a) $6x - 3y - 12 = 0$

(b) $9x - 3y - 9 = 0$

Solution To convert to slope-intercept form, solve for y.

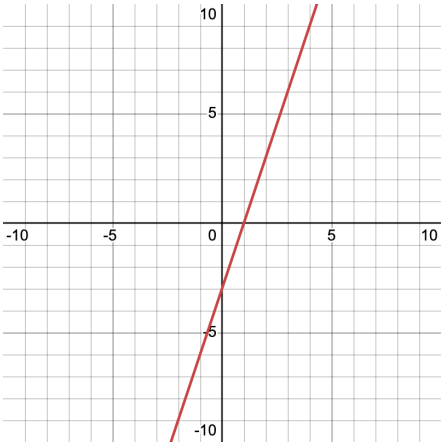
(a)

$$6x - 3y - 12 = 0 \Leftrightarrow 3y = 6x - 12$$
$$\Leftrightarrow \boxed{y = 2x - 4}$$



(b)

$$9x - 3y - 9 = 0 \Leftrightarrow 3y = 9x - 9$$
$$\Leftrightarrow \boxed{y = 3x - 3}$$



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(4) Write the slope intercept form of the equation that satisfies the given conditions:

(a) Slope is 3, passing through $(3, 5)$

(b) Slope is -2 passing through $(-3, -6)$

(c) Passing through $(-6, 0)$ and $(0, 6)$

(d) Passing through $(-3, 1)$ and $(6, -2)$

Solution

(a) Method 1: Use point-slope form

$$\begin{aligned} y - 5 = 3(x - 3) &\Leftrightarrow y - 5 = 3x - 9 \\ &\Leftrightarrow \boxed{y = 3x - 4} \end{aligned}$$

Method 2: Use slope-intercept and solve for b

$$\begin{aligned} y = mx + b \Rightarrow 5 &= 3(3) + b \\ \Leftrightarrow 5 &= 9 + b \\ \Leftrightarrow b &= -4 \end{aligned}$$

So the equation is $\boxed{y = 3x - 4}$

(b) Method 1: Use point-slope form

$$\begin{aligned} y - (-6) = -2(x - (-3)) &\Leftrightarrow y + 6 = -2(x + 3) \\ &\Leftrightarrow y + 6 = -2x - 6 \\ &\Leftrightarrow \boxed{y = -2x - 12} \end{aligned}$$

Method 2: Use slope-intercept and solve for b

$$\begin{aligned} y = mx + b \Rightarrow -6 &= -2(-3) + b \\ \Leftrightarrow -6 &= 6 + b \\ \Leftrightarrow b &= -12 \end{aligned}$$

So the equation is $\boxed{y = -2x - 12}$

(c) The first thing we have to do is find the slope

$$m = \frac{6 - 0}{0 - (-6)} = \frac{6}{0 + 6} = \frac{6}{6} = 1$$

Now we can either use method 1 or method 2 (above) with either point. I'll do only one method below, but feel free to do the others.

$$y - 0 = 1(x - (-6)) \Leftrightarrow \boxed{y = x + 6}$$

(d) The first thing we have to do is find the slope

$$m = \frac{-2-1}{6-(-3)} = \frac{-3}{6+3} = \frac{-3}{9} = \frac{-1}{3}$$

Now we can either use method 1 or method 2 (above) with either point. I'll do only one method below, but feel free to do the others.

$$y-(-2) = -\frac{1}{3}(x-6) \Leftrightarrow y+2 = -\frac{1}{3}x+2$$
$$\Leftrightarrow \boxed{y = -\frac{1}{3}x}$$

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(5) Write the point-slope form of the equation satisfying the given conditions. Then use the point-slope form of the equation to write the slope intercept form of the equation.

(a) Parallel to $y = 4x$ and passing through $(4, 1)$

(b) Perpendicular to $y = 4x$ and passing through $(1, 4)$

(c) Passing through $(-8, 8)$ and perpendicular to the line that has an x-intercept of $(3, 0)$ and a y-intercept of $(0, -6)$.

Solution Parallel lines have the same slope. Perpendicular lines have slopes that are opposite reciprocals.

(a) The slope of $y = 4x$ is $m = 4$, so the point of a parallel line would also be $m = 4$. We can use point-slope form:

$$\boxed{y-1 = 4(x-4)} \Leftrightarrow y-1 = 4x-16$$
$$\Leftrightarrow \boxed{y = 4x-15}$$

(b) The slope of $y = 4x$ is $m = 4$, so the slope of a perpendicular line would be $m = -\frac{1}{4}$. We can use point-slope form:

$$\boxed{y-4 = -\frac{1}{4}(x-1)} \Leftrightarrow y-4 = -\frac{x}{4}+\frac{1}{4}$$
$$\Leftrightarrow y = -\frac{x}{4}+\frac{1}{4}+4$$
$$\Leftrightarrow y = -\frac{x}{4}+\frac{1}{4}+\frac{16}{4}$$
$$\Leftrightarrow \boxed{y = -\frac{x}{4}+\frac{17}{4}}$$

(c) We first have to figure out the slope of the perpendicular line.

$$m = \frac{-6-0}{0-3} = \frac{-6}{-3} = 2$$

So the perpendicular line will have slope $-\frac{1}{2}$. Using point-slope form we have:

$$y - 8 = -\frac{1}{2}(x-(-8)) \Leftrightarrow \boxed{y - 8 = -\frac{1}{2}(x+8)}$$

$$\Leftrightarrow y - 8 = -\frac{1}{2}x - 4$$

$$\Leftrightarrow \boxed{y = -\frac{1}{2}x + 4}$$

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Key:

(1) (a) $m = -3$, $b = 0$
(b) $m = -\frac{3}{4}$, $b = 2$
(c) $m = \frac{2}{3}$, $b = -4$

(2) Check graphs with a graphing utility
(a) y-int: $(0,2)$, x-int: $(-4,0)$
(b) y-int: $(0,0)$, x-int: $(0,0)$
(c) y-int: $(0,3)$, x-int: $(-4,0)$
(d) y-int: $(0,2)$, x-int: $(3,0)$

(3) Check graphs with a graphing utility
(a) $y = 2x - 4$
(b) $y = 3x - 3$

(4) (a) $y = 3x - 4$
(b) $y = -2x - 12$
(c) $y = x + 6$
(d) $y = -\frac{1}{3}x$

(5) (a) $y - 1 = 4(x-4)$, $y = 4x - 15$
(b) $y - 4 = -\frac{1}{4}(x-1)$, $y = -\frac{1}{4}x + \frac{17}{4}$
(c) $y - 8 = -\frac{1}{2}(x+8)$, $y = -\frac{1}{2}x + 4$