ALGEBRA PROBLEM SESSION #3 SOLUTIONS

Slopes and Intercepts

1. To find the x-intercept, set $y = 0$ and solve for x, the result will be the x-coordinate of the x-intercept $(a, 0)$. To find the y-intercept, set $x = 0$ and solve for y, the result will be the y-coordinate of the y-intercept $(0, b)$.

2. The line must a horizontal line passing through Quadrants III and IV, so the line slope must be $m = 0$.

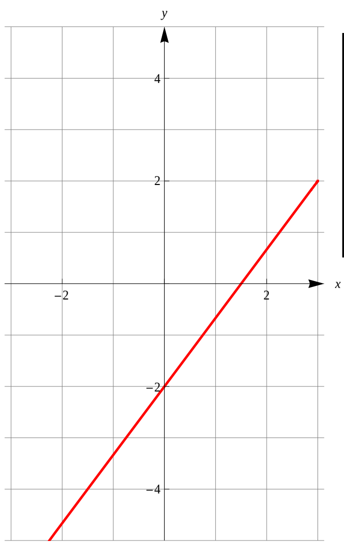
3. The slope can be used to describe the slant of a line by thinking of the slope as the rise over the run. If the slope is negative, then from left to right the line falls. If the slope is positive, then from left to right the line rises. The absolute value of the slope will give the steepness of the line.

4. If the slope of a line is zero, then the line is a horizontal line. If the slope of a line is undefined, then the line is a vertical line.

5. The slope is $m = -\frac{1}{2}$ and the y-intercept is $(0, b) = (0, \frac{3}{2})$.

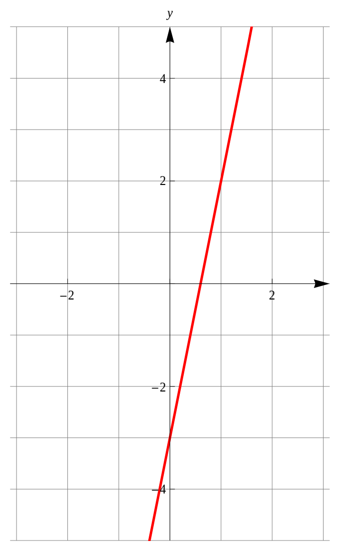
6. $y = ax$ and $y = -\frac{1}{a}x$

7. a)



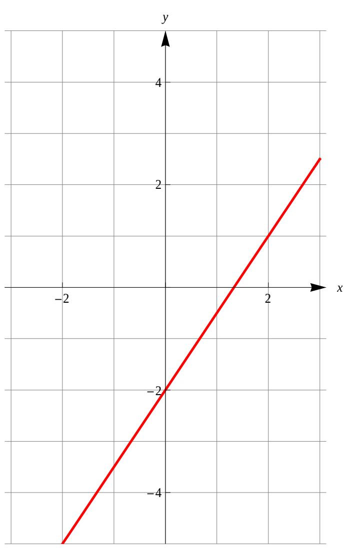
$$(a, 0) = \left(\frac{3}{2}, 0\right)$$
and
$$(0, b) = (0, -2)$$

b)



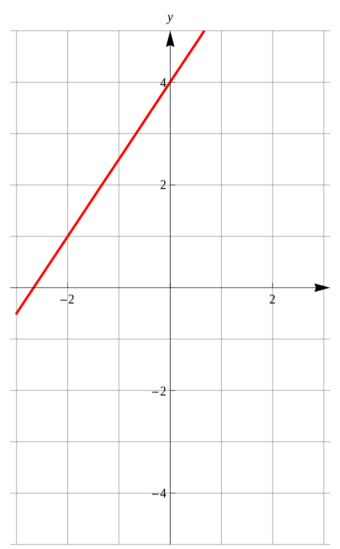
$$(a, 0) = \left(\frac{3}{5}, 0\right)$$
and
$$(0, b) = (0, -3)$$

c)



$$(a, 0) = \left(\frac{4}{3}, 0\right)$$
and
$$(0, b) = (0, -2)$$

d)



$$(a, 0) = \left(-\frac{8}{3}, 0\right)$$
and
$$(0, b) = (0, 4)$$

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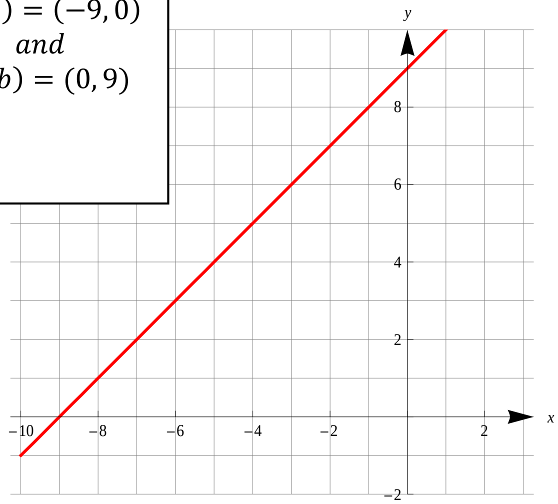
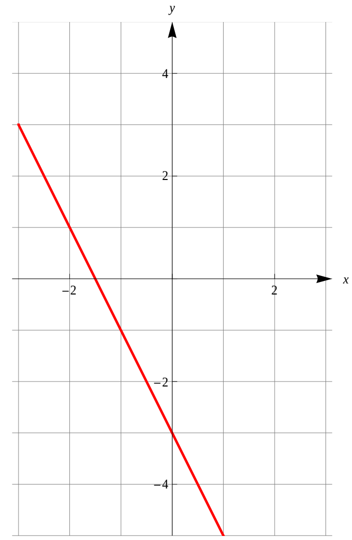
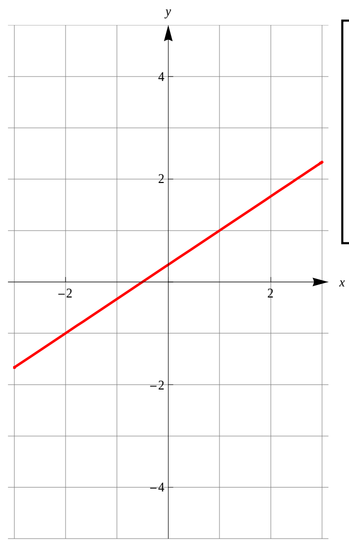
$(a, 0) = (-9, 0)$
and
$(0, b) = (0, 9)$

e) 

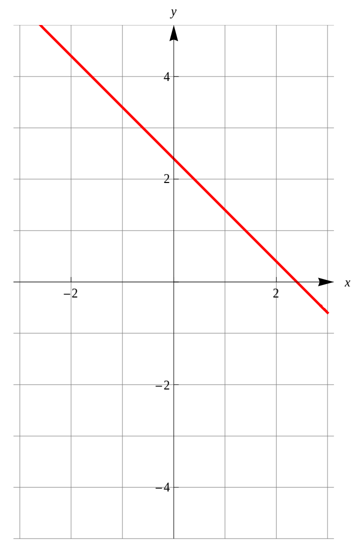
f) 

$(a, 0) = \left(-\frac{3}{2}, 0\right)$
and
$(0, b) = (0, -3)$

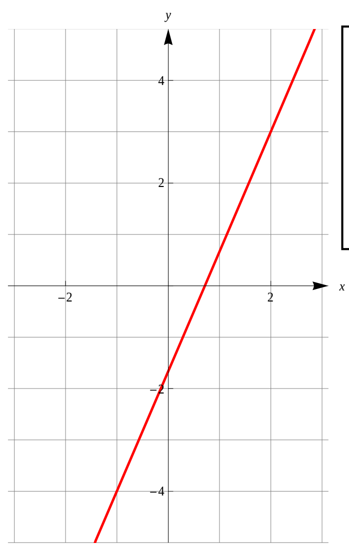
8. a) $m = \frac{2}{5}$ b) $m = -\frac{2}{5}$ c) $m = 0$

9. a) 

$m = \frac{2}{3}$ and
$(0, b) = (0, \frac{1}{3})$

b) 

$m = -1$ and
$(0, b) = (0, \frac{12}{5})$

c) 

$m = \frac{7}{3}$ and
$(0, b) = (0, -\frac{5}{3})$

ALGEBRA PROBLEM SESSION #3 SOLUTIONS

Graphing Linear Equations

1. Label the given point as $(x_1, y_1)$and set the slope of equation m equal to the slope of the given equation since parallel lines have the same slope. Then, use the point-slope form of a linear equation to solve for the requested equation, ie. $y - y_1 = m(x - x_1)$.

2. $a = 4$

3. $b = -4$

4. We cannot solve for the equations of parallel and perpendicular lines unless we are given more information, so we will include a constant for the y-coordinate of the lines' y-intercept $(0, b)$.
   a) $3x - y = 3$ has slope $m = 3$. Thus, a parallel line will have an equation of the form $y = 3x + b_1$, where b_1 is a constant and a perpendicular line will have an equation of the form $y = -\frac{1}{3}x + b_2$, where b_2 is a constant.
   b) $3y - 2x = 18$ has slope $m = \frac{2}{3}$. Thus, a parallel line will have an equation of the form $y = \frac{2}{3}x + b_1$, where b_1 is a constant and a perpendicular line will have an equation of the form $y = -\frac{3}{2}x + b_2$, where b_2 is a constant.
   c) $x - y = 7$ has slope $m = 1$. Thus, a parallel line will have an equation of the form $y = x + b_1$, where b_1 is a constant and a perpendicular line will have an equation of the form $y = -x + b_2$, where b_2 is a constant.
   d) $3x + 2y = 12$ has slope $m = -\frac{3}{2}$. Thus, a parallel line will have an equation of the form $y = -\frac{3}{2}x + b_1$, where b_1 is a constant and a perpendicular line will have an equation of the form $y = \frac{2}{3}x + b_2$, where b_2 is a constant.

5. The graph of $y = \frac{1}{2}x + 5$ is the graph of $y = \frac{1}{2}x - 5$ vertically shifted 10 units up.

6. The graph of $y = \frac{1}{2}x - 5$ is the graph of $y = \frac{1}{2}x$ vertically shifted 5 units down.

7. $a < 0$ and $b > 0$

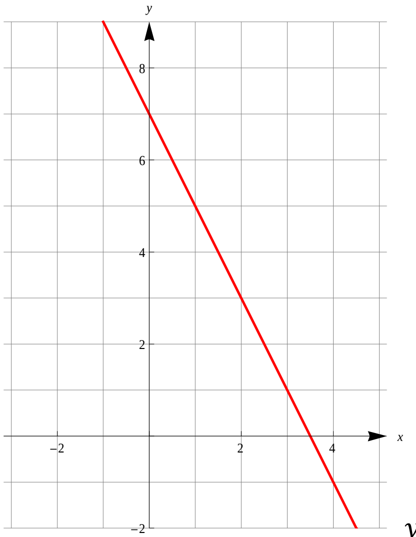
8. $B = 0$ and both $0 < A$ and $0 < C$ or $A < 0$ and $C < 0$

10. A line perpendicular to $x = 4$ will be of the form $y = b$, where b is the y-coordinate of the y-intercept. Thus, with a y-intercept of (0, 3), the equation becomes $y = 3$.

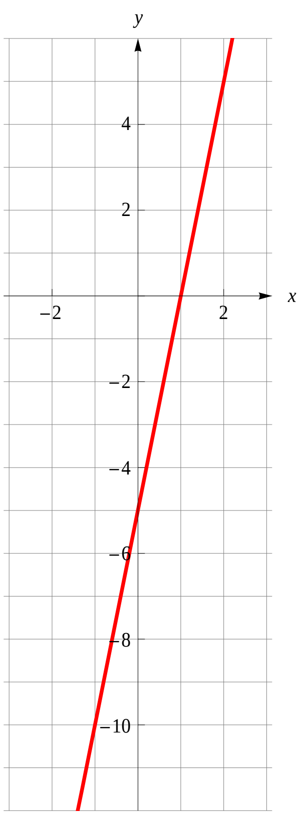
11. $-Bx + Ay = 0$

12. $-Ax + y = 0$ and $x + Ay = 0$

13. a) $y = -\frac{3}{4}x - 1$ b) $y = -2x + 1$ c) $y = 9x - 5$

13. 

$y = -2x + 7$

14. 

$y = 5x - 5$