INTERMEDIATE ALGEBRA

Math 0310

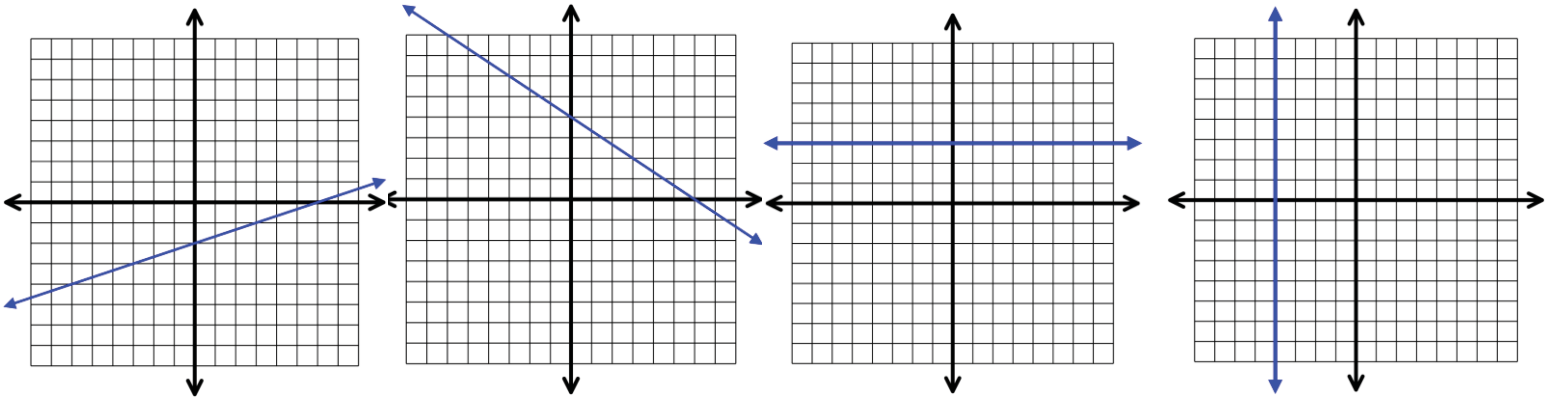
Turnell

Updated July 2015

LONE STAR COLLEGE

Notes-- Linear Functions-Part 1

Part1: Solve for y. Identify the slope and y-intercept.



The slope-intercept formula of a line is: $y = mx + b$

Where m is the slope of the line and b is the y-intercept.

Solve for y. Identify the slope and y-intercept.

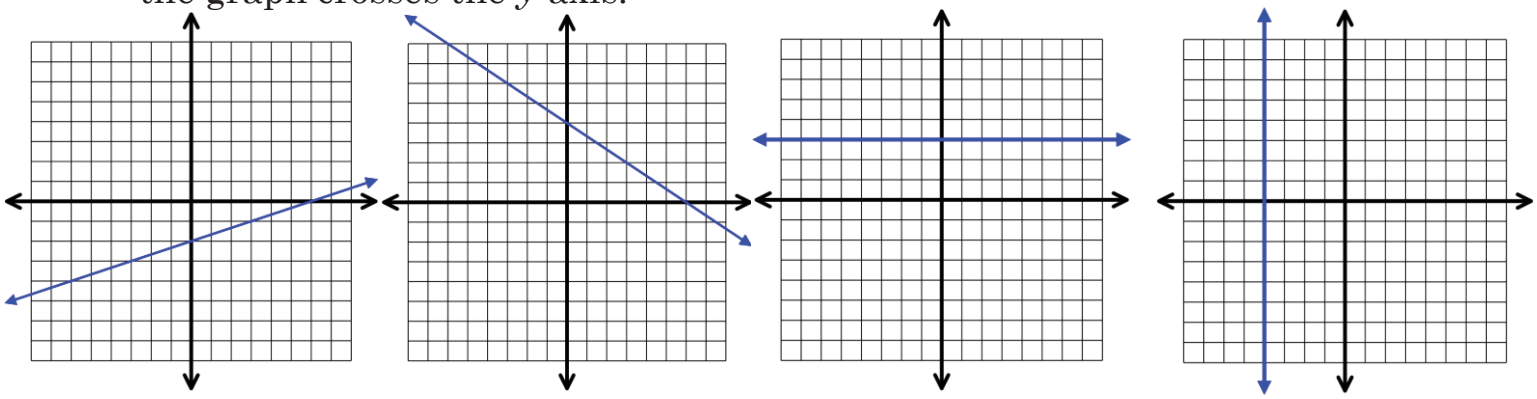
Ex #1. $3x - 4y = 10$

Ex #2. $\frac{2}{3}x - \frac{1}{5}y = -3$

Ex #3. $5y + 15 = 0$

Notes-- Linear Functions—Part 2

Part 2: Find the x-intercept and y-intercept.
The x-intercept is where the graph crosses the x-axis and the y-intercept is where the graph crosses the y-axis.



Find the x-intercept and y-intercept.

Ex. #1: $4x+3y=8$

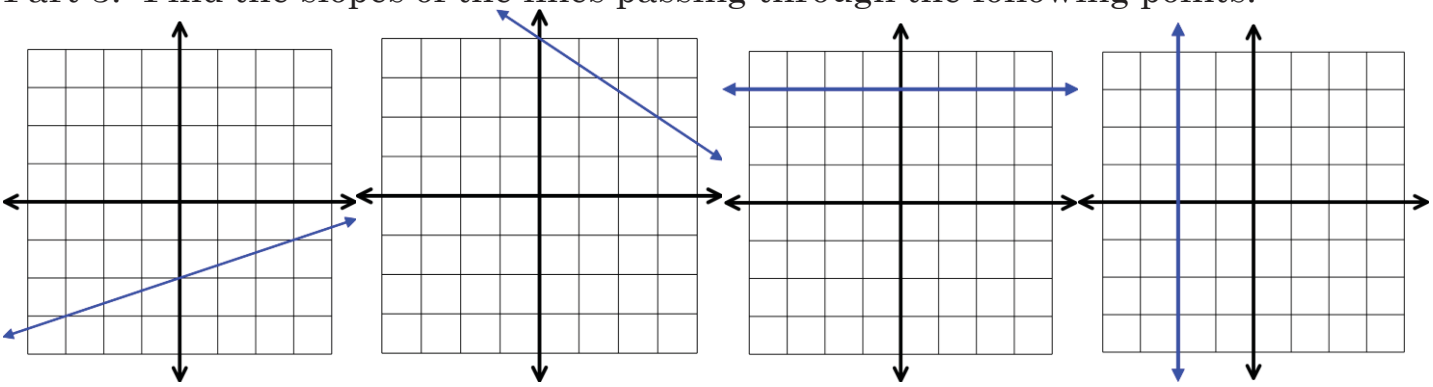
Ex. #2: $2x-5y=0$

Ex. #3: $y=7x-1$

Ex. #4: $\frac{3}{4}x-\frac{2}{5}y=-1$

Notes-- Linear Functions—Part 3

Part 3: Find the slopes of the lines passing through the following points.



Formula for slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\qquad$ $m = \frac{rise}{run}$

Find the slopes of the lines passing through the following points.

Ex #1: (7,0) and (0,4)

Ex #2: (–2,–5) and (1,9)

Ex #3: (3,–5) and (–1,–5)

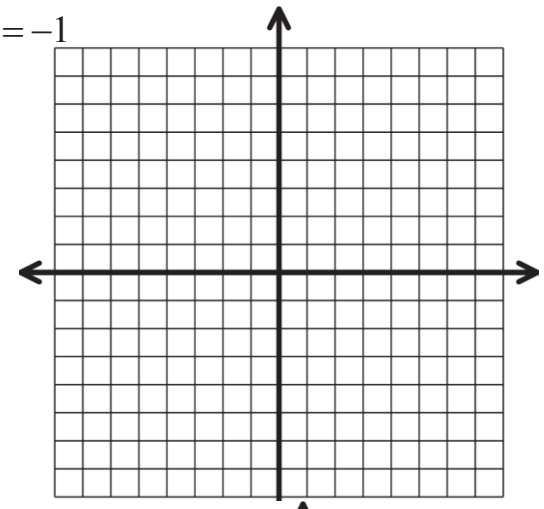
Ex #4: (7,–2) and (7,5)

Notes-- Linear Functions—Part 4

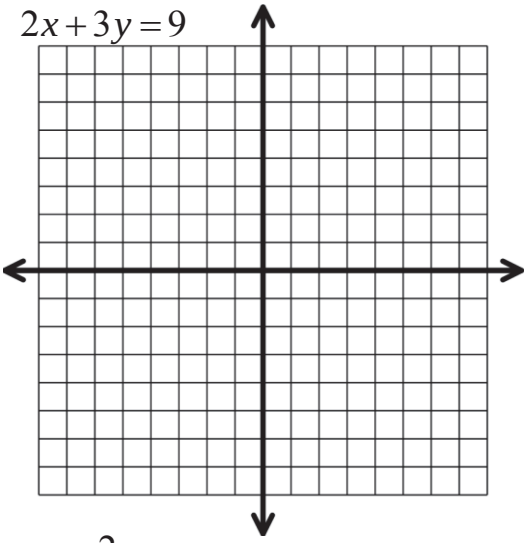
Part 4: Graphing lines using the slope and y-intercept.

1. Solve the equation for y.
2. Identify m and b.
3. Plot b on the *y-axis*.
4. From b, use the slope $\left(\frac{rise}{run}\right)$ to get more points.

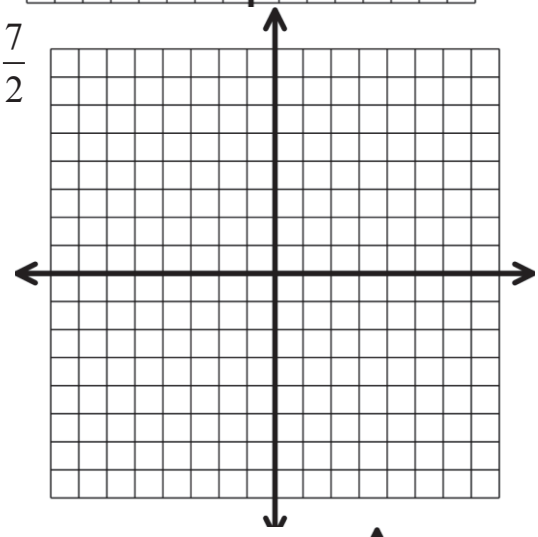
Ex. #1: $4x - y = -1$



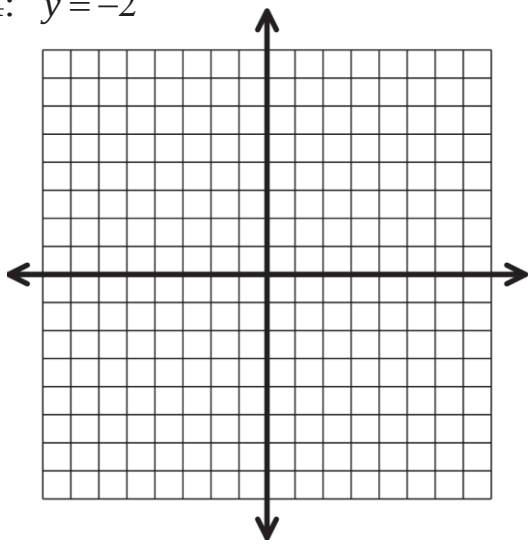
Ex. #2: $2x + 3y = 9$



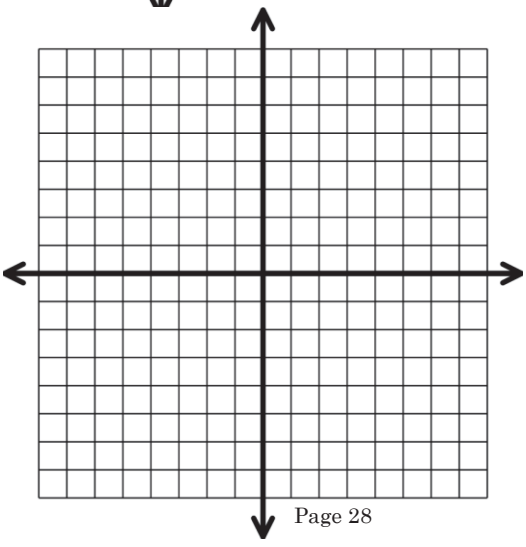
Ex. #3: $y = 2x - \frac{7}{2}$



Ex. #4: $y = -2$



Ex. #5: $3x - 12 = 0$



Linear Functions

Do all work on notebook paper. All steps should be shown. All work should be neat and organized.

Solve for y. Identify the slope and *y*-intercept.

1. $2x - y = 6$
2. $3x + 4y = 8$
3. $x + 3y = 0$
4. $-2x = 3y + 8$
5. $4y - 12 = 0$
6. $\frac{1}{3}y + \frac{3}{4}x - 2 = 0$

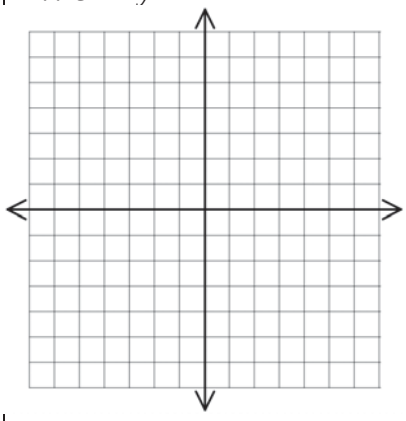
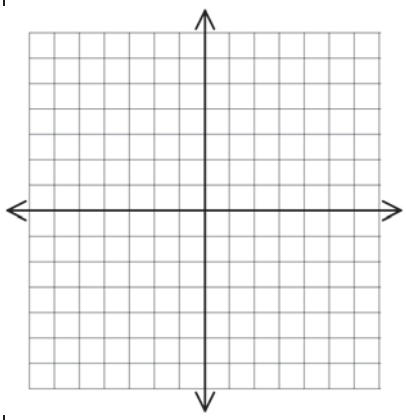
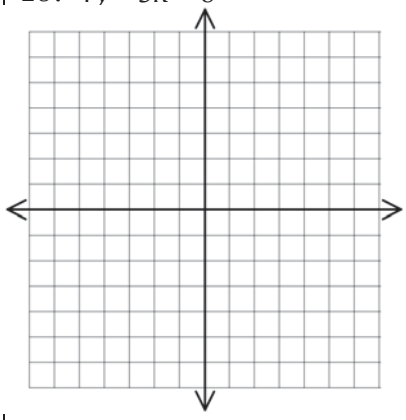
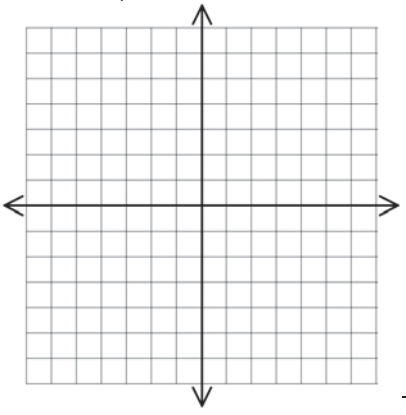
Find the *x*-intercept and *y*-intercept.

7. $3x + 4y = 6$
8. $4x - 5y = 10$
9. $5x - 3y = 0$
10. $y = 2x + 5$
11. $\frac{2}{3}y - \frac{1}{5}x = -3$

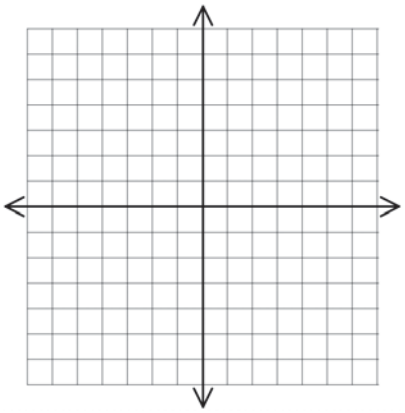
Find the slopes of the lines passing through the following points.

12. $(6,0)$ and $(0,-3)$
13. $(-4,1)$ and $(3,-5)$
14. $(3,-7)$ and $(6,2)$
15. $(5,2)$ and $(9,2)$
16. $(-3,1)$ and $(-3,10)$

Graph the following lines. Find the slope and *y*-intercept.

17. $3x - y = 2$ 	Show work *m*= *b*=
18. $x + 2y = 4$ 	Show work *m*= *b*=
19. $4y - 3x = 8$ 	Show work *m*= *b*=
20. $3x + 5y = 0$ 	Show work *m*= *b*=

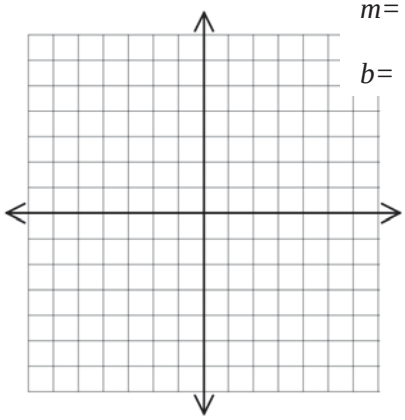
21. $y = -2x + \frac{5}{2}$



$m=$

$b=$

22. $y = 4$



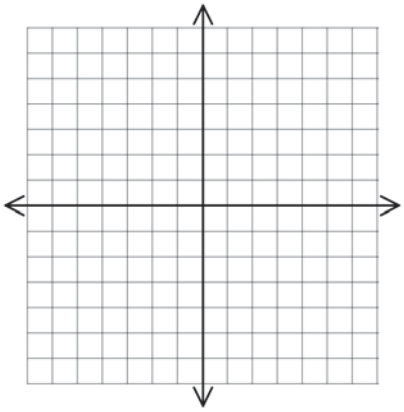
$m=$

$b=$

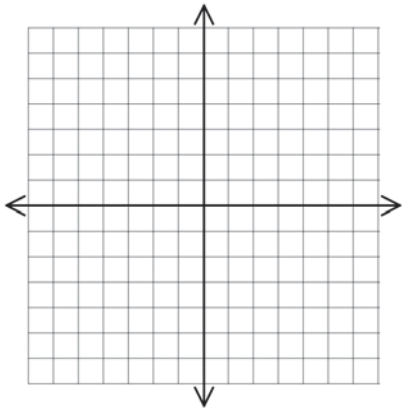
23. $x = -3$

$m=$

$b=$



24. $3y + 6 = 0$

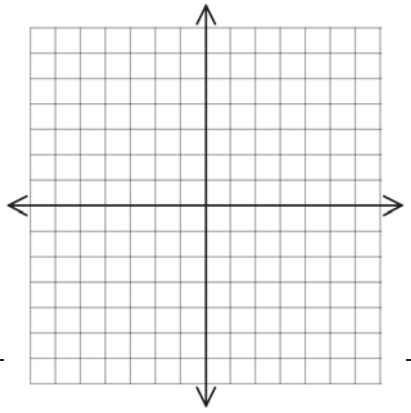


Show work

$m=$

$b=$

25. $5x - 15 = 0$



Show work

$m=$

$b=$

Linear Functions-Answers

1. $y = 2x - 6; m = 2;$ y-intercept $= -6$

2. $y = -\frac{3}{4}x + 2; m = -\frac{3}{4};$ y-intercept $= 2$

3. $y = -\frac{1}{3}x;\ m = -\frac{1}{3};$ y-intercept $= 0$

4. $y = -\frac{2}{3}x - \frac{8}{3};\ m = -\frac{2}{3};$ y-intercept $= -\frac{8}{3}$

5. $y = 3;\ m = 0;$ y-intercept $= 3$

6. $y = -\frac{9}{4}x + 6;\ m = -\frac{9}{4};$ y-intercept $= 6$

7. x-intercept $= 2;$ y-intercept $= \frac{3}{2}$

8. x-intercept $= \frac{5}{2};$ y-intercept $= -2$

9. x-intercept $= 0;$ y-intercept $= 0$

10. x-intercept $= -\frac{5}{2};$ y-intercept $= 5$

11. x-intercept $= 15;$ y-intercept $= -\frac{9}{2}$

12. $m = \frac{1}{2}$

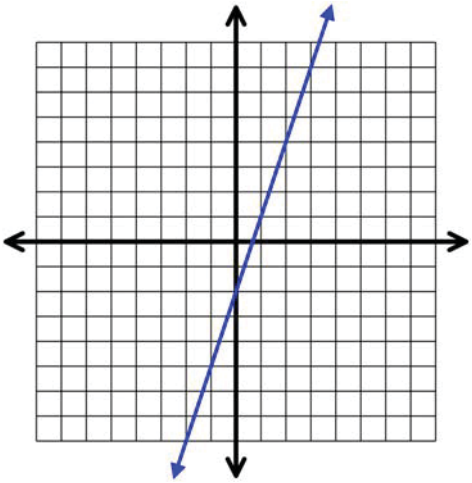
13. $m = -\frac{6}{7}$

14. $m = 3$

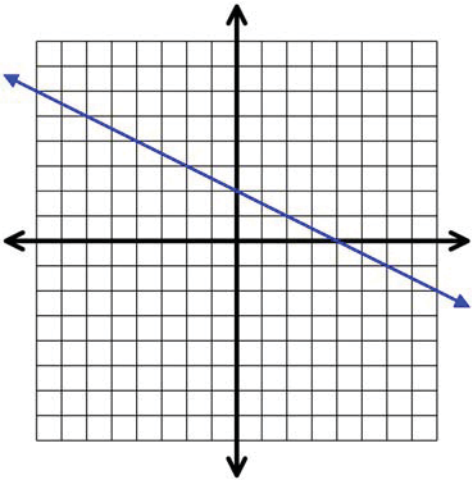
15. $m = 0$

16. $m =$ *undefined*

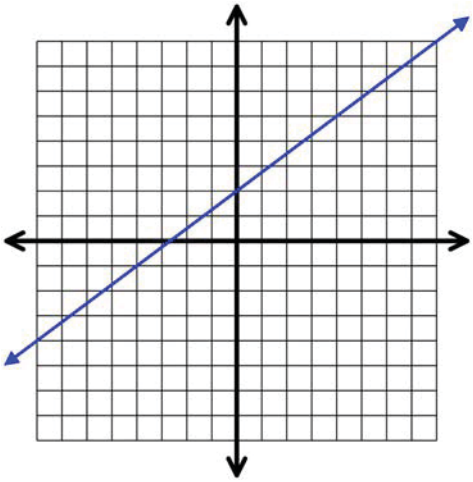
17. $m = 3$; y-intercept $= -2$



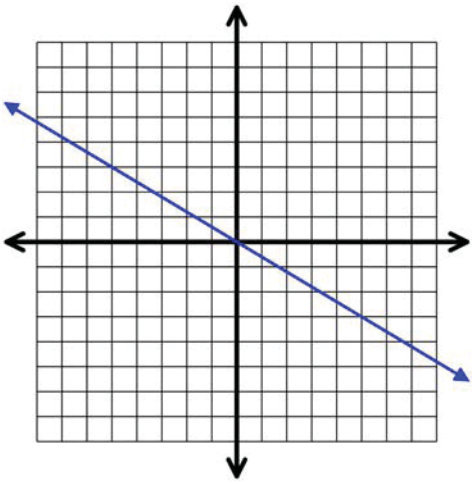
18. $m = -\frac{1}{2}$; y-intercept $= 2$



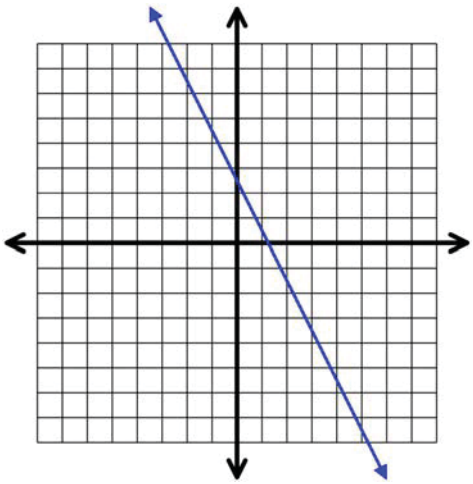
19. $m = \frac{3}{4}$; y-intercept $= 2$



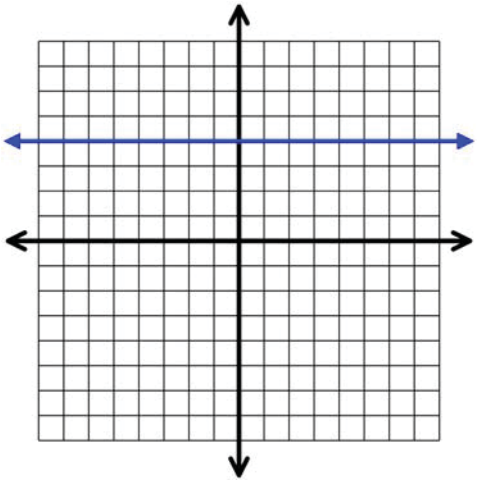
20. $m = -\frac{3}{5}$; y-intercept $= 0$



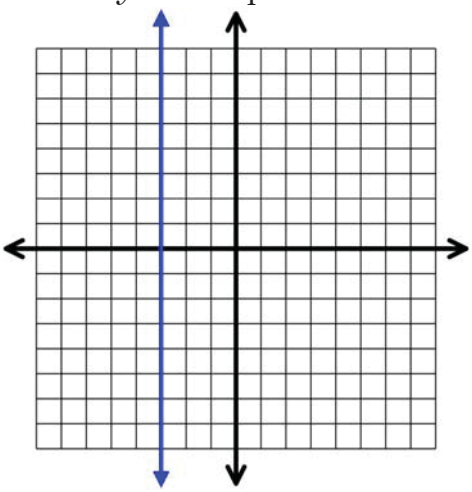
21. $m = -2$; y-intercept $= \frac{5}{2}$



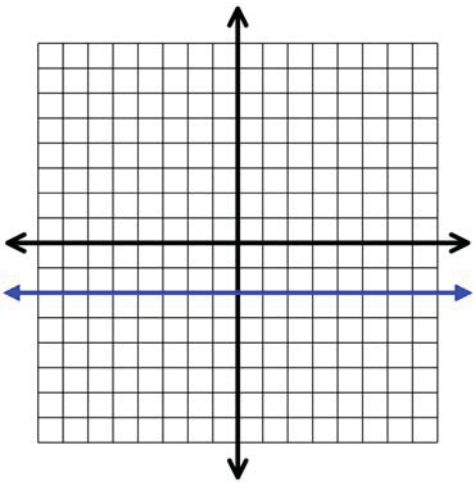
22. $m = 0$; y-intercept $= 4$



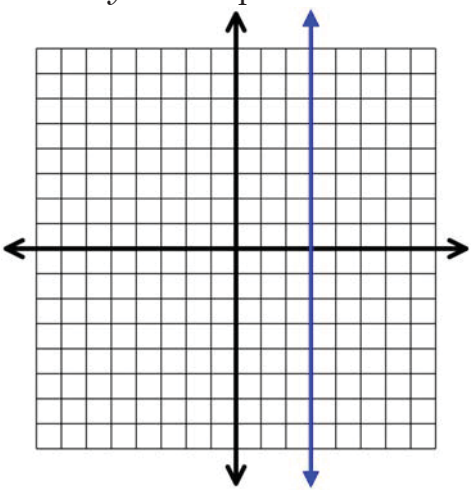
23. $m =$ *undefined* ; y-intercept ***NONE***



24. $m = 0$; y-intercept $= -2$



25. $m =$ *undefined* ; y-intercept ***NONE***



Notes-- Equations of Lines-Part 1

1. Find the equation of a line given the slope and *y*-intercept.
2. Find the equation of a line given the slope and a point.

Find the equation of the line with the given information. Write answers in slope-intercept form, if possible.

You will need to know 2 formulas:

1. Slope-intercept formula: $y = mx + b$
2. Point-Slope formula. $y - y_1 = m(x - x_1)$

Ex. #1: $m = \frac{2}{5}$; y-intercept $= -5$

Ex. #2: $m = 0$; y-intercept $= -\frac{1}{2}$

Find an equation of a line given a slope and a point:

Use the Point-Slope Formula: $y - y_1 = m(x - x_1)$

$m =$ slope Point (x_1, y_1)

Ex. #3: $m = 5$; through $(-2,1)$

Ex. #4: $m = -\frac{3}{5}$; through $(-4,-2)$

Extra Practice: $m = \frac{2}{3}$; through $(4, -1)$

Horizontal	Vertical
Equation: $y =$ number $m = 0$ only has a y-intercept	Equation: $x =$ number m is undefined only has an x-intercept
Ex. #5: $m = 0$; through $(-5, 3)$	Ex. #6: m is undefined; through $(-2, -7)$

Equations of Lines-Part 2

Find the equation of the line passing through the given points.

1. Find the slope first. $m = \frac{y_2 - y_1}{x_2 - x_1}$
2. Pick one point and now use the Point-Slope formula. $y - y_1 = m(x - x_1)$
3. Write answers in slope-intercept form, if possible.

Ex. #1: Passing through the points $(-1,3)$ and $(4,7)$

Ex. #2: Passing through the points $(3,-4)$ and $(-5,-1)$

Ex. #3: Passing through the points $(5,-6)$ and $(-3,-6)$

Ex. #4: Passing through the points $(-7,-4)$ and $(-7,8)$

Equations of Lines

Do all work on notebook paper. All steps should be shown. All work should be neat and organized.

Find the equations of the following lines. Write answers in slope-intercept form.

1. $m = 5$; y-intercept $= \frac{1}{2}$
2. $m = 1$; y-intercept $= -9$
3. $m = \frac{1}{2}$; y-intercept $= -3$
4. $m = 0$; y-intercept $= 11$
5. $m = 0$; y-intercept $= \frac{2}{5}$

Find the equations of the following lines. Write answers in slope-intercept form when possible.

6. $m = 3$; through $(-1,-2)$
7. $m = \frac{9}{2}$; through $(3,8)$
8. $m = -\frac{2}{3}$; through $(5,3)$
9. $m = 0$; through $(4,-12)$
10. m is undefined; through $(3,7)$

Find the equations of the lines passing through the given points. Write answers in slope-intercept form when possible.

11. $(-2,4)$ and $(-5,7)$
12. $(-8,6)$ and $(4,-3)$
13. $(0,0)$ and $(-2,3)$
14. $(8,-4)$ and $(-3,-4)$
15. $(5,3)$ and $(5,-6)$

Equations of Lines-Answers

Write answers in slope-intercept form.

1. $y = 5x + \frac{1}{2}$
2. $y = x - 9$
3. $y = \frac{1}{2}x - 3$
4. $y = 11$
5. $y = \frac{2}{5}$

.....

6. $y = 3x + 1$
7. $y = \frac{9}{2}x - \frac{11}{2}$
8. $y = -\frac{2}{3}x + \frac{19}{3}$
9. $y = -12$
10. $x = 3$
11. $y = -x + 2$
12. $y = -\frac{3}{4}x$
13. $y = -\frac{3}{2}x$
14. $y = -4$
15. $x = 5$

Notes-- Parallel Lines

Parallel Lines have the same slope.

Find the equations of the lines passing through the given points parallel to the given line. Write answers in slope-intercept form when possible.

Ex #1: Through $(2,5)$; parallel to $3x+7y=14$

1. Find the slope of the given line by solving for y.
2. Use the slope and the given point to write equation of line.
3. Write answers in slope-intercept form when possible.

Ex #2: Through $(-4,-9)$; parallel to $y=2$	Ex #3: Through $(7,-2)$; parallel to $x=8$

Notes-- Perpendicular Lines

Perpendicular Lines slopes are opposite reciprocals.
(flip and change the sign)

Find the equations of the lines passing through the given points perpendicular to the given line. Write answers in slope-intercept form when possible.

Ex #1: Through $(2,5)$; perpendicular to $y = 4x - 5$

1. Find the slope of the given line by solving for y.
2. Find the opposite reciprocal of the slope. We label this $m_{\perp}$
3. Use $m_{\perp}$ and the given point to write equation of line.
4. Write answers in slope-intercept form when possible.

Ex #2: Through $(-7,2)$; perpendicular to $3x - 5y = 15$

Ex #3: Through $(-4,-9)$; perpendicular to $y = 8$	Ex #4: Through $(7,-2)$; perpendicular to $x = -3$

Parallel and Perpendicular Lines

Do all work on notebook paper. All steps should be shown. All work should be neat and organized.

Find the equations of the lines passing through the given points parallel to the given line. Write answers in slope-intercept form when possible.

1. Through $(1,-2)$; parallel to $y=3x+4$
2. Through $(3,11)$; parallel to $5x+4y=-8$
3. Through $(-2,5)$; parallel to $3x-7y=21$
4. Through $(3,-7)$; parallel to $y=12$
5. Through $(-8,-9)$; parallel to $x=5$

Find the equations of the lines passing through the given points perpendicular to the given line. Write answers in slope-intercept form when possible.

6. Through $(-1,2)$; perpendicular to $y=3x+4$
7. Through $(3,11)$; perpendicular to $3x-5y=-10$
8. Through $(-2,5)$; perpendicular to $4x+3y=21$
9. Through $(3,-7)$; perpendicular to $y=4$
10. Through $(-8,-9)$; perpendicular to $x=-7$

Parallel and Perpendicular Lines-Answers

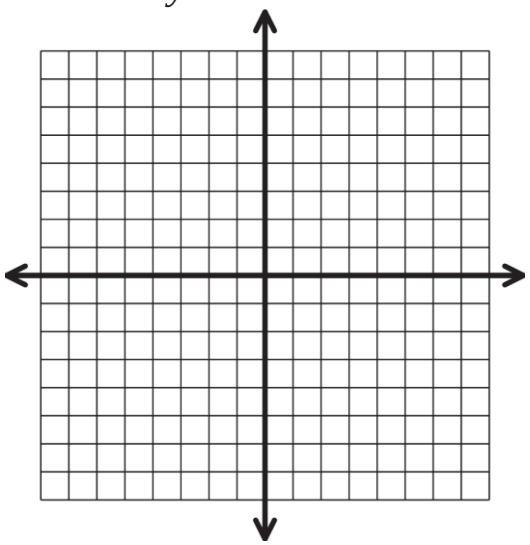
1. $y = 3x - 5$
2. $y = -\frac{5}{4}x + \frac{59}{4}$
3. $y = \frac{3}{7}x + \frac{41}{7}$
4. $y = -7$
5. $x = -8$
6. $y = -\frac{1}{3}x + \frac{5}{3}$
7. $y = -\frac{5}{3}x + 16$
8. $y = \frac{3}{4}x + \frac{13}{2}$
9. $x = 3$
10. $y = -9$

Notes-- Linear Inequalities

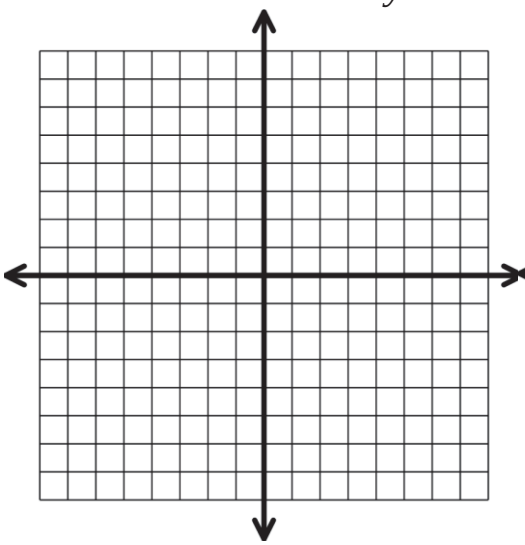
Graph the solution set of the linear inequalities:
Steps:

1. Solve for *y*. Identify the slope and *y*-intercept.
2. Graph the line by plotting the *y*-intercept first (on the *y*-axis) and then use the slope to get other points, $\left(\frac{rise}{run}\right)$.
2. Use a solid line if you have $\leq$ or $\geq$.
   Use a dashed or dotted line if you have $<$ or $>$.
3. Look at the *y*-intercept. Shade below the *y*-intercept if less than.
   Shade above the *y*-intercept if greater than.

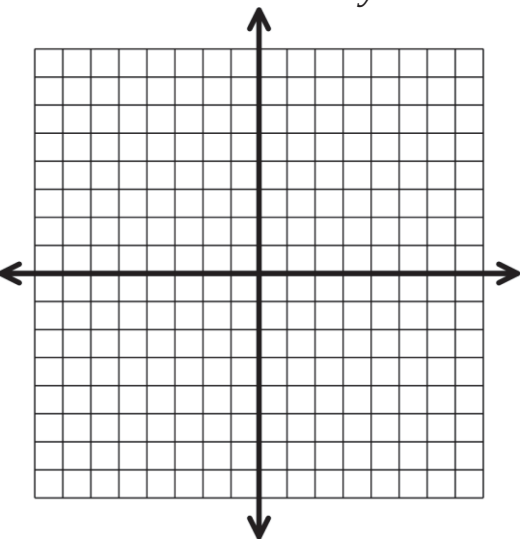
Ex. #1: $y - 3x > 2$



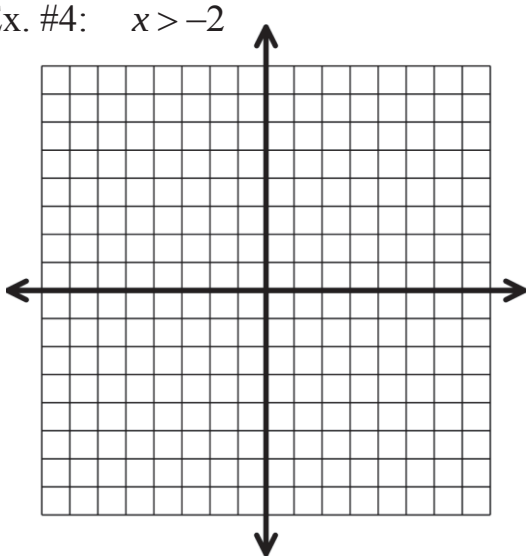
Ex. #2: $9 > 4x + 3y$



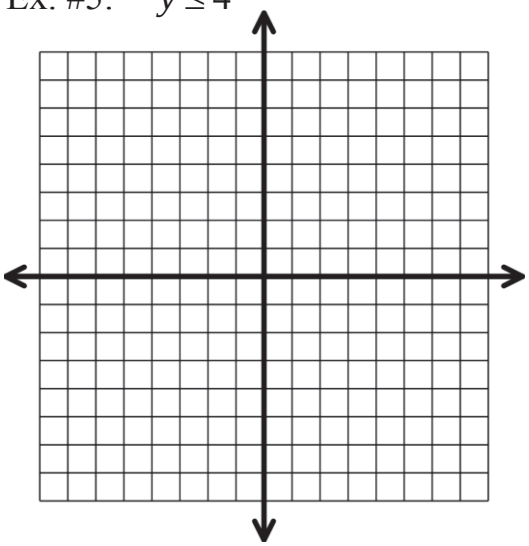
Ex. #3: $4x \leq 12 - 3y$



Ex. #4: $x > -2$



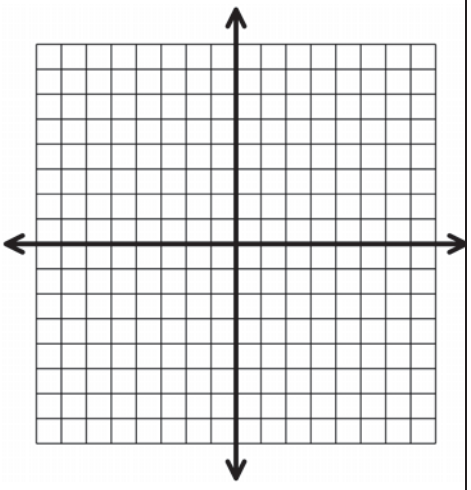
Ex. #5: $y \leq 4$



Linear Inequalities in Two Variables

Solve for y, if possible. Identify the slope and y-intercept. Graph.

1. $y - 2x < 6$

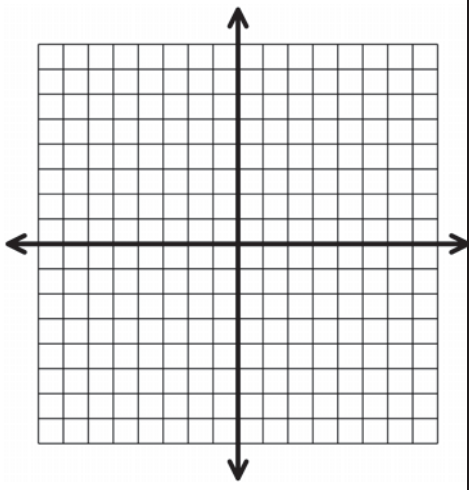


y _____

$m =$ _____

$b =$ _____

2. $3x + 2y \geq 12$

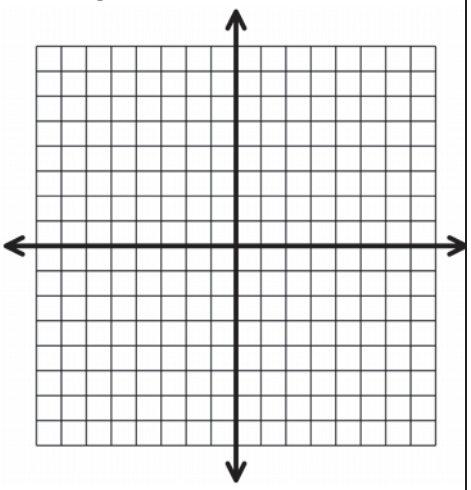


y _____

$m =$ _____

$b =$ _____

3. $y \leq \frac{1}{3}x - 1$

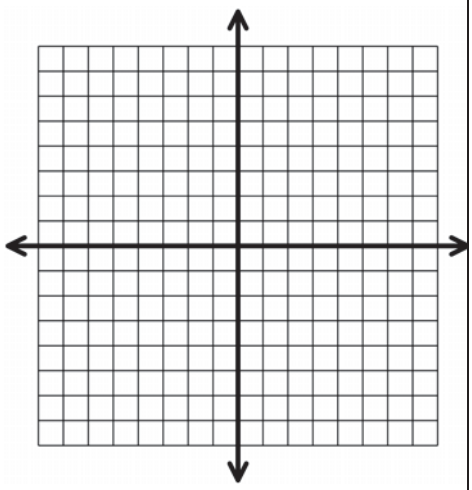


y _____

$m =$ _____

$b =$ _____

4. $y > 4x - 5$

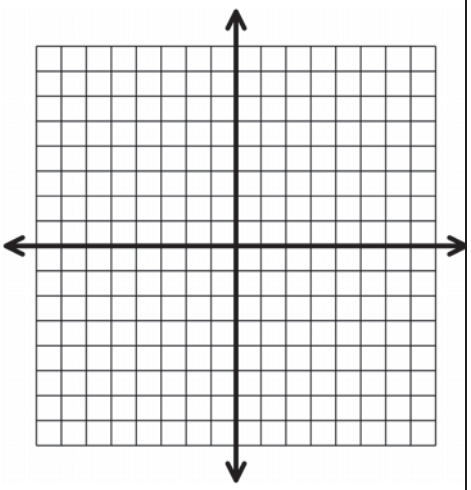


y _____

$m =$ _____

$b =$ _____

5. $4x \leq 2y - 6$

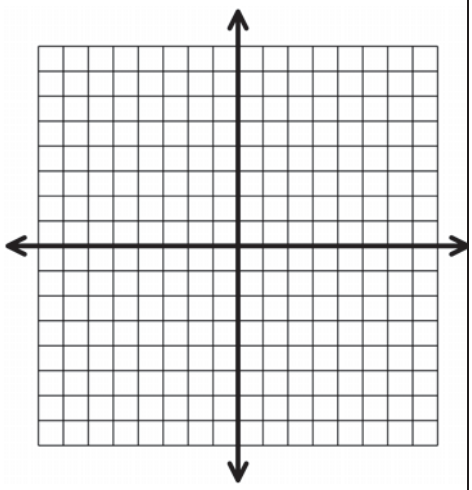


y _____

$m =$ _____

$b =$ _____

6. $7 < 3x - y$

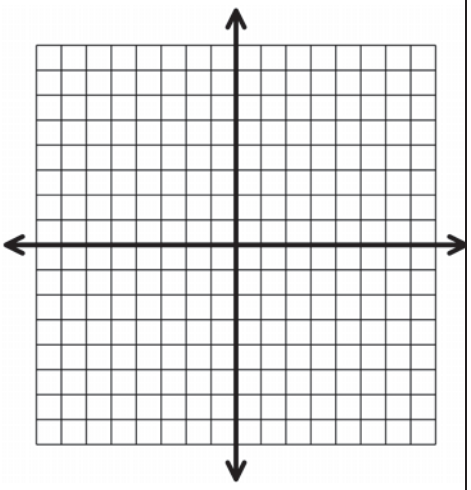


y _____

$m =$ _____

$b =$ _____

7. $5x > -3y + 9$

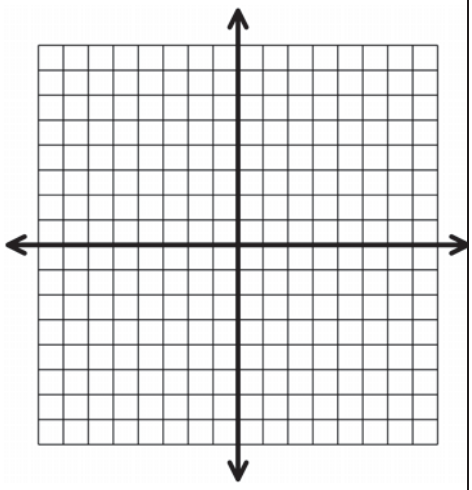


y _____

$m =$ _____

$b =$ _____

8. $-2y \leq 7x - 8$

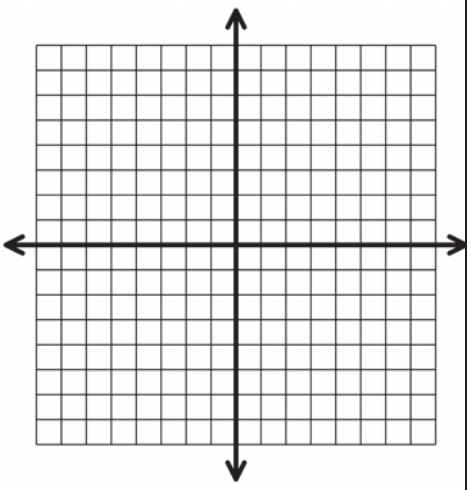


y _____

$m =$ _____

$b =$ _____

9. $2x > 3y$

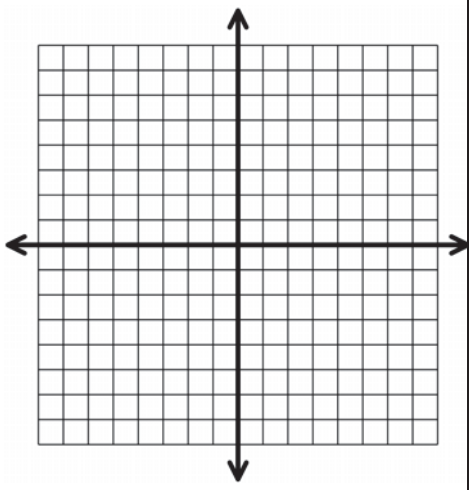


y _____

$m =$ _____

$b =$ _____

10. $x + 4y \geq 0$

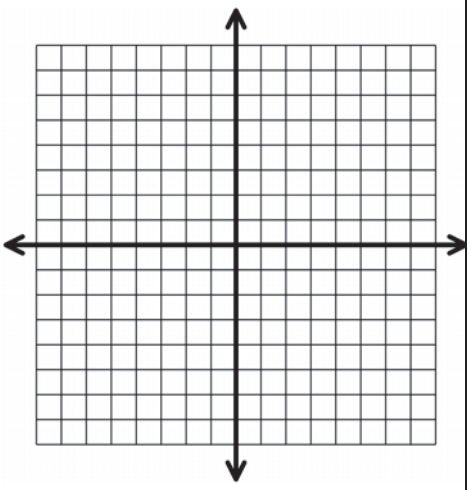


y _____

$m =$ _____

$b =$ _____

11. $y < 3$

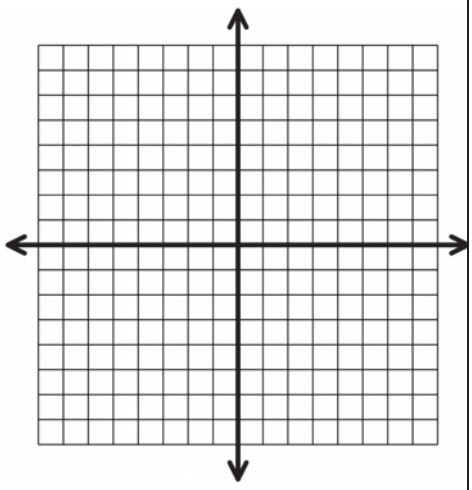


y _____

$m =$ _____

$b =$ _____

12. $x \geq -5$



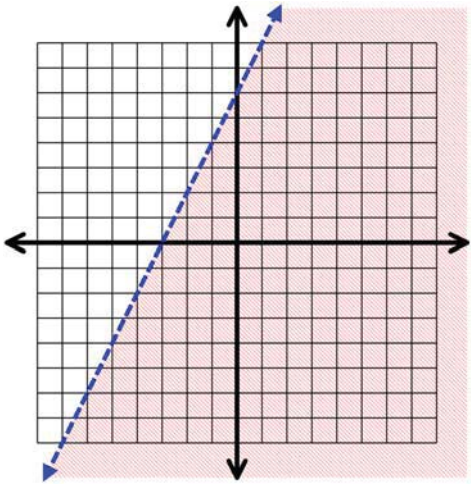
y _____

$m =$ _____

$b =$ _____

Linear Inequalities in Two Variables

1. $y - 2x < 6$

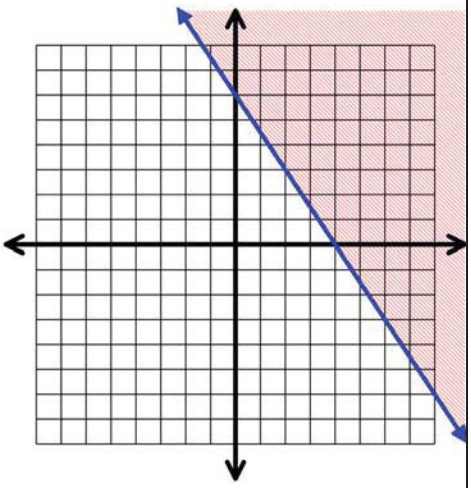


$y < 2x + 6$

$m = 2$

$b = 6$

2. $3x + 2y \geq 12$

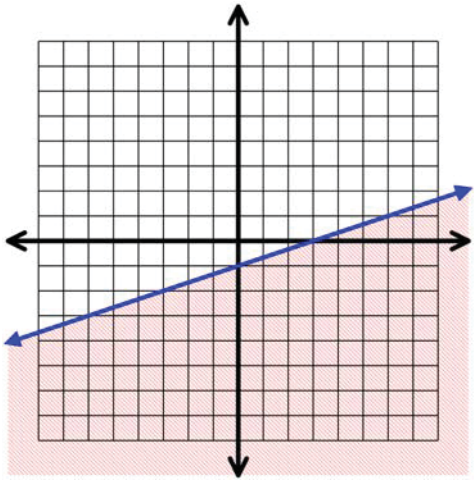


$y \geq -\frac{3}{2}x + 6$

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

$b = 6$

3. $y \leq \frac{1}{3}x - 1$

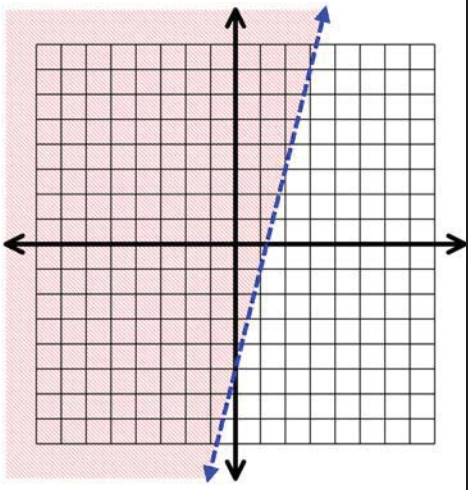


$y \leq \frac{1}{3}x - 1$

$m = \frac{1}{3}$

$b = -1$

4. $y > 4x - 5$

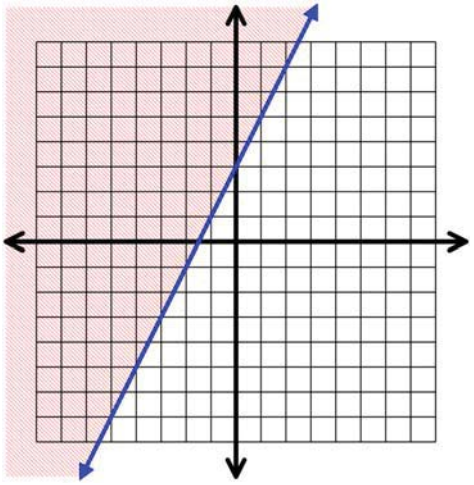


$y > 4x - 5$

$m = 4$

$b = -5$

5. $4x \leq 2y - 6$

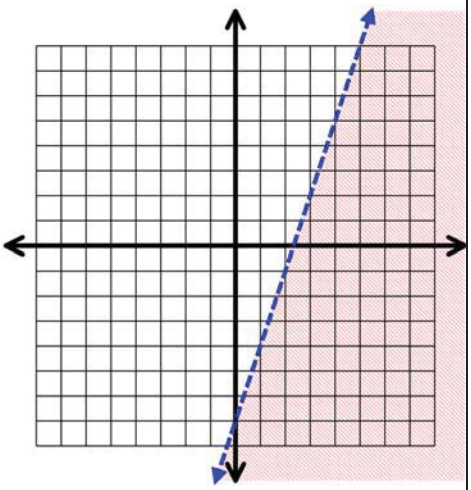


$y \geq 2x + 3$

$m = 2$

$b = 3$

6. $7 < 3x - y$

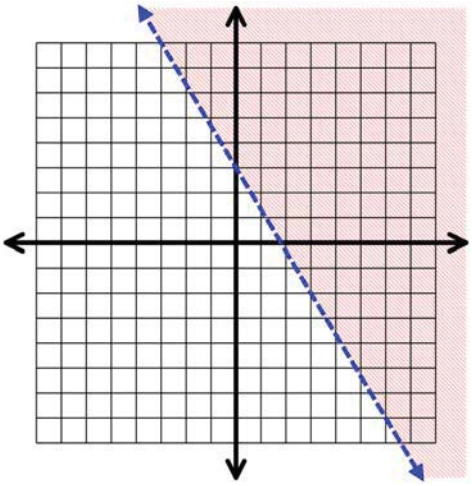


$y < 3x - 7$

$m = 3$

$b = -7$

7. $5x > -3y + 9$

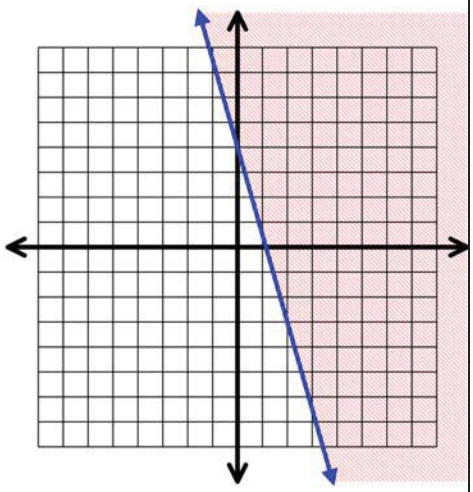


$y > -\frac{5}{3}x + 3$

$m = -\frac{5}{3}$

$b = 3$

8. $-2y \le 7x - 8$

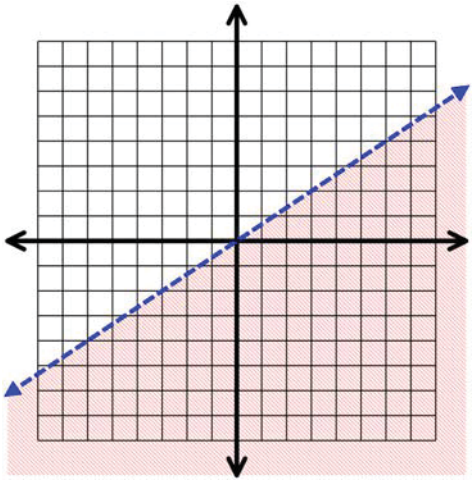


$y \ge -\frac{7}{2}x + 4$

$m = -\frac{7}{2}$

$b = 4$

9. $2x > 3y$

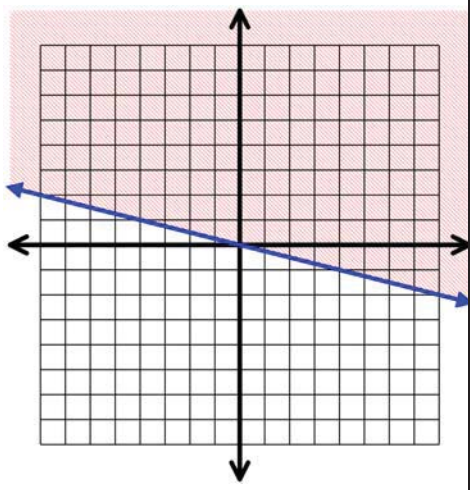


$y < \frac{2}{3}x$

$m = \frac{2}{3}$

$b = 0$

10. $x + 4y \ge 0$

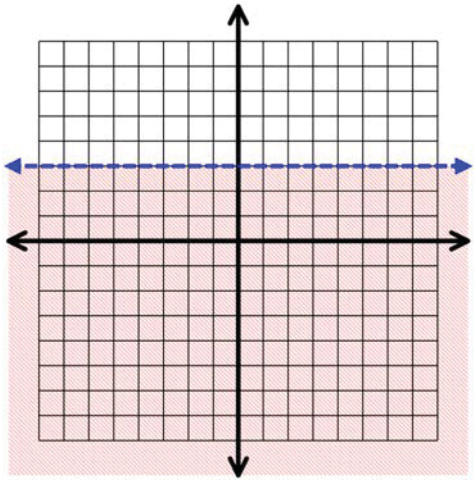


$y \ge -\frac{1}{4}x$

$m = -\frac{1}{4}$

$b = 0$

11. $y < 3$

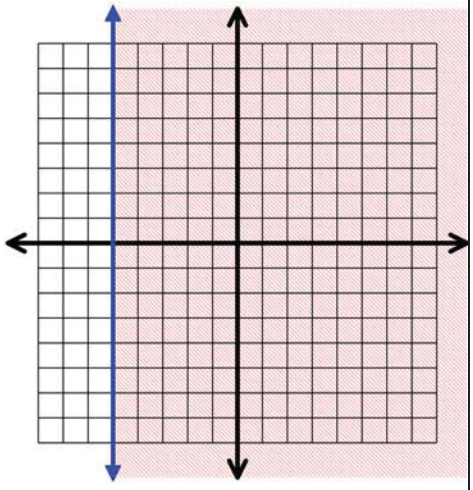


$y < 3$

$m = 0$

$b = 3$

12. $x \ge -5$



$m = undefined$

$b = NONE$