Foundations & Pre-Calculus 10
Homework & Notebook

Name:_____ **Block:**_____

Teacher: Miss Zukowski **Date Submitted:** ___/___/ 2018

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unit #6 part II: slope, Intercepts & linear Relations

Submission Checklist: *(make sure you have included <u>all</u> components for full marks)*

- ❑ Cover page & Assignment Log
- ❑ Class Notes
- ❑ Homework *(attached any extra pages to back)*
- ❑ Quizzes *(attached original quiz + <u>corrections made on separate page</u>)*
- ❑ Practice Test/ Review Assignment

Assignment Rubric: Marking Criteria			
Excellent (5) - Good (4) - Satisfactory (3) - Needs Improvement (2) - Incomplete (1) - NHI (0)		**Self Assessment**	**Teacher Assessment**
Notebook	• *All* teacher notes complete • Daily homework assignments have been recorded & completed *(front page)* • Booklet is neat, organized & well presented *(ie: name on, no rips/stains, all pages, no scribbles/doodles, etc)*	/5	/5
Homework	• *All* questions attempted/completed • *All* questions **<u>marked</u>** *(use answer key, correct if needed)*	/5	/5
Quiz *(1mark/dot point)*	• Corrections have been made **accurately** • Corrections made in a *<u>different colour pen/pencil</u>* *(+½ mark for each correction on the quiz)*	/2	/2
Practice Test *(1mark/dot point)*	• Student has completed all questions • Mathematical working out leading to an answer is shown • Questions are **marked** *(answer key online)*	/3	/3
Punctuality	• *All checklist items were submitted, and completed on the day of the unit test. (-1 each day late)*	/5	/5
Comments:		/20	/20

5) Introduction to linear Relations

- Linear relations are _____ relationships
- Linear relations are always _____
    - One exception:

Part 1: Algebra Review

Example #1: Solve the following equations for y.

a) $4x + 6y = 24$

b) $\frac{x}{2} + \frac{y}{3} = 1$

Part 2: Graphing Using Slope and Y-Intercept

We know two ways of graphing equations:

1. _____

   Best used when: _____
2. _____

   Best used when: _____

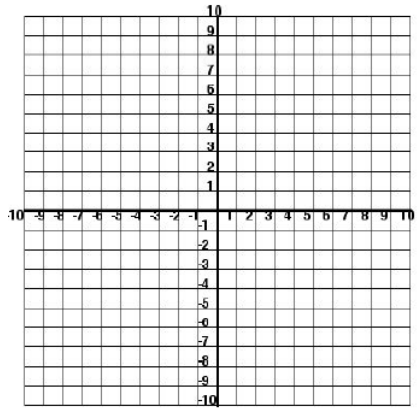
A ***new*** third way! Graphing from the equation $\boldsymbol{y = mx + b}$

m = _____ b = _____

STEPS

1. Solve for y (if necessary)
2. Plot the y-intercept
3. Use the slope $\left(\frac{rise}{run}\right)$ to plot 2nd point
4. Keep plotting more points using the same slop until you have at least 4 points

Example #2: $y = \frac{1}{2}x + 3$



assignment # 5
pages #3-10 questions #1-25

Key Terms

Term	Definition	Example
Linear Relation		
Linear Function		
Ordered pair		
Slope		
y-intercept		
x-intercept		
Slope-intercept form of a linear equation		
Point-slope form of a linear equation		
General form of a linear equation		
Parallel Lines		
Perpendicular Lines		
Dependent Variable		
Independent Variable		
Linear Function		

Introduction to Linear Relations

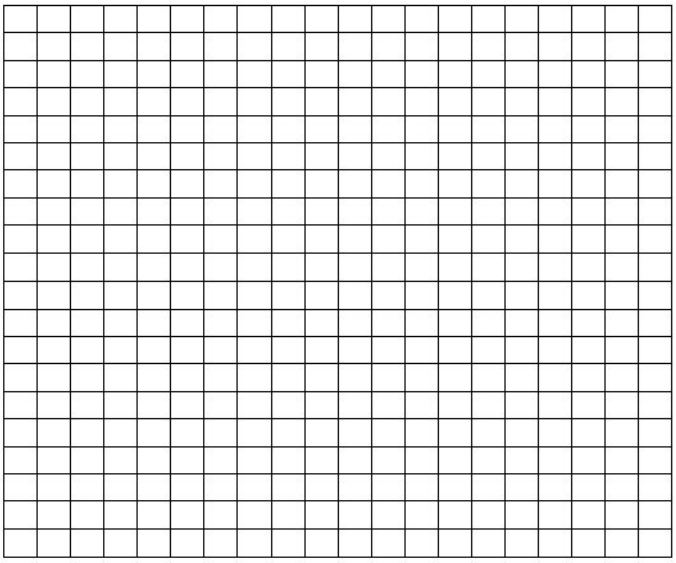
We have examined relations between two quantities earlier in this course. Now we will narrow our focus to examine only linear relations.

Linear relations are straight line relationships. Each output value is proportionate to the input value. That is, the change occurs at a constant rate.

Eg. An employee that works for an hourly wage ($10 per hour).

This is a linear relationship because the employees earnings increase at a constant rate.
The equation that relates the **Earnings** and the **hours worked** is $\boldsymbol{E = 10h}$.

1. Plot the relationship described above if the domain is {0,1,2,3,4,5,6,7}.



2. What is the shape of the graph you just plotted?

3. Is the relation $E = 10h$ a function?

4. Which variable in the relation $E = 10h$ is the dependent variable

5. Challenge #1:

If $y = 3x$, find the missing values of y.

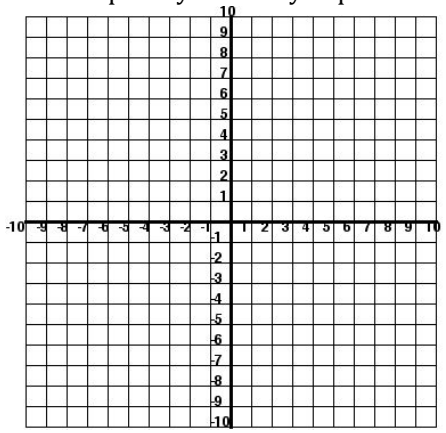
$y = 3x$	
x	y
-2	-6
-1	
0	
1	
2	

6. What name do we give the pairs of numbers in each row?

7. Does $(-8, -24)$ satisfy the equation above.

8. How many pairs of numbers are there that satisfy that equation?

9. What shape do you see if you plot each of the pairs of numbers in the table above?



Finding coordinates from an equation:

A **Table of Values** is a tool used to find ordered pairs from an equation.

This is a table of values set up to find 5 ordered pairs for the equation $y = 3x$.

$y = 3x$	
x	y

Step1: Select 5 *input* values of ***x*** and write them in the *x* column. Eg. -2,-1,0,1,2

Step2: Substitute them into the equation and solve to find the ***y*** value.

This is the completed table from above.

This gives us 5 ordered pairs:
$(-2,-6),(-1,-3)(0,0)(1,3)(2,6)$

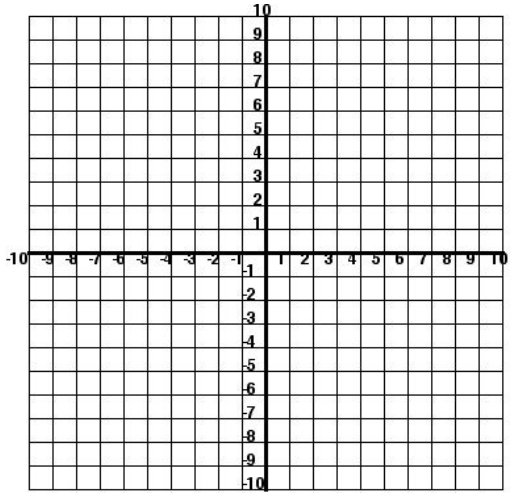
$y = 3x$	
x	y
-2	-6
-1	-3
0	0
1	3
2	6

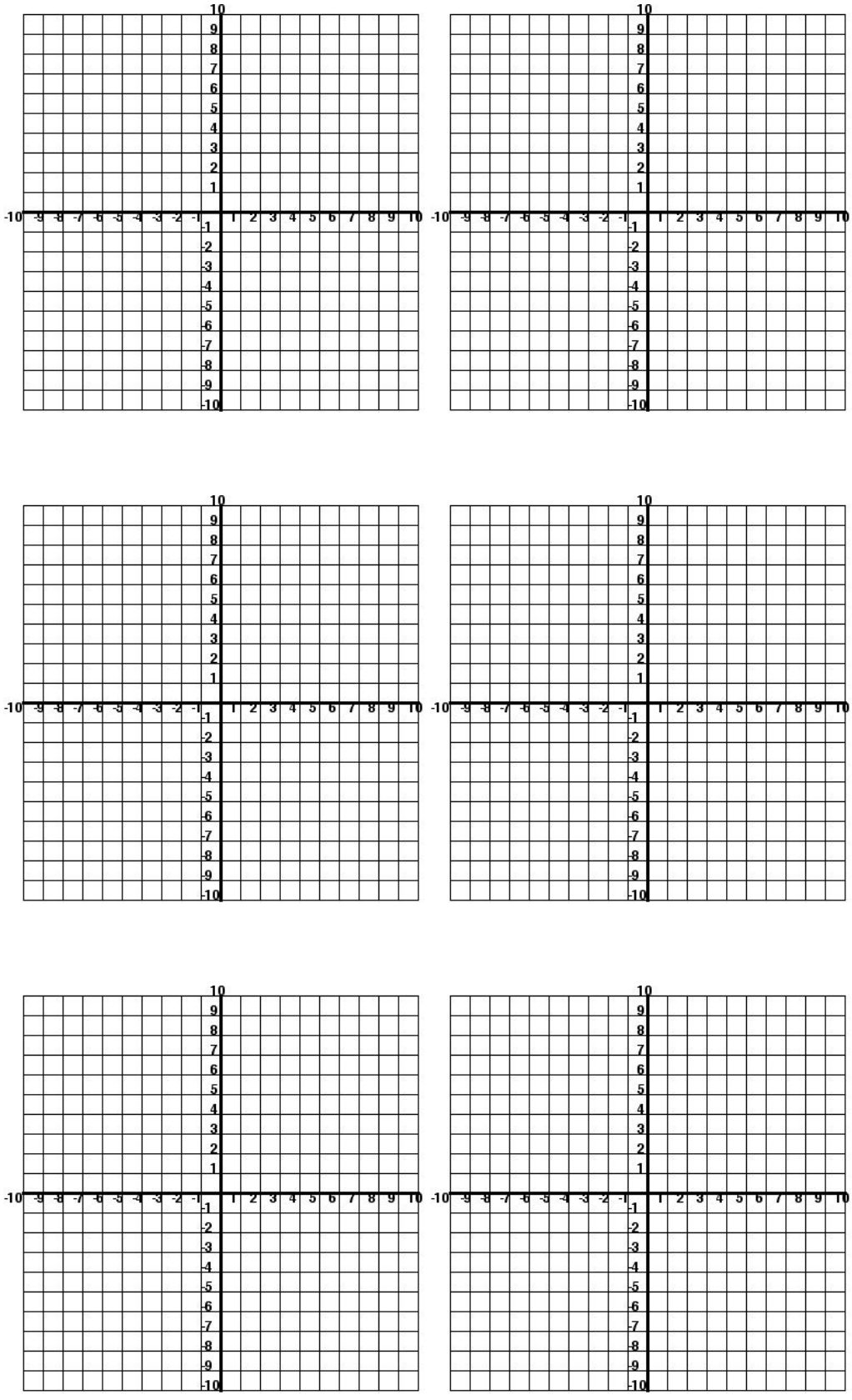
**I chose to input values of *x*, but I could have selected values of *y* and solved for *x (although I find that more difficult in this case)*.

10. Challenge #2:

Using the *table of values*, graph the equation $y = 3x$ on the graph provided.

$y = 3x$	
x	y
-2	-6
-1	
0	
1	
2	





Some Algebra Review:

When working with a table of values and linear equations, it is most useful to have 'y' isolated on the left.

Example:

$$2x + 3y = 12$$
$$3y = -2x + 12$$
$$y = -\frac{2}{3}x + 4$$

11. Isolate y.
$2x - 4y = 16$

12. Isolate y.
$4y - 8x + 12 = 0$

13. Isolate y.
$20 + 3x = 5y$

14. Isolate y.
$\frac{1}{3}x - \frac{3}{2}y = 1$

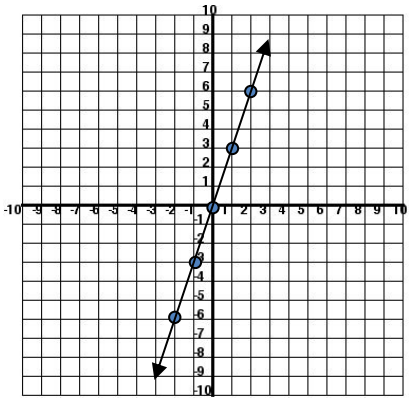
15. Isolate y.
$x - \frac{3y}{4} + 9 = 0$

16. Isolate y.
$\frac{2x}{3} + \frac{y}{2} - \frac{3}{5} = 1$

Graphing from a Table of Values.

Using the *table of values*, graph the equation $y = 3x$ on the graph provided.

$y = 3x$	
x	y
-2	-6
-1	-3
0	0
1	3
2	6



Step1: From the table of values we get the following ordered pairs.
$(-2,-6), (-1,-3), (0,0), (1,3), (2,6)$

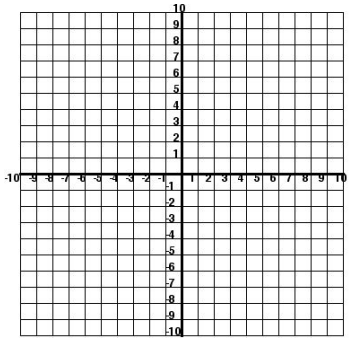
Step2: Plot each of the ordered pairs.

Step3: Draw a line through the points with arrows on each end.

Use the table of values, if necessary, to graph each of the following equations.

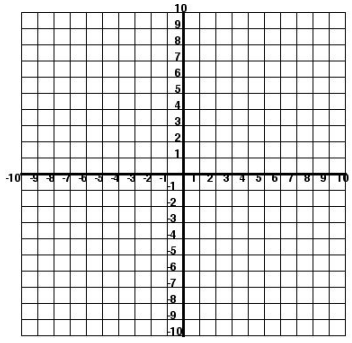
17. $y = 2x + 1$

$y = 2x + 1$	
x	y
-2	
-1	
0	
1	
2	



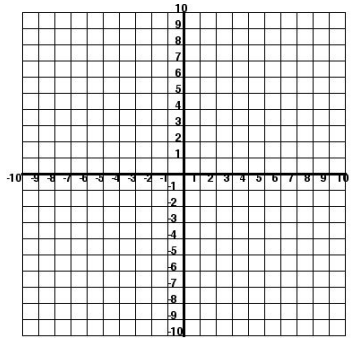
18. $y = 4x - 1$

$y = 4x - 1$	
x	
-2	
-1	
0	
1	
2	



19. $3x + y = -2$

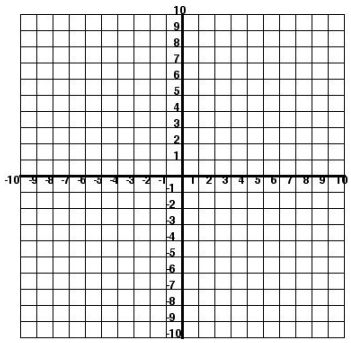
$3x + y = -2$	
x	y
-2	
-1	
0	
1	
2	



Use the table of values, **if necessary**, to graph each of the following equations.

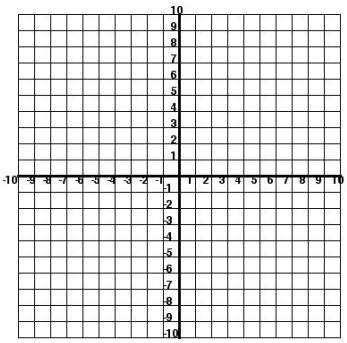
20. $y = \frac{x}{2} + 1$

$y = \frac{x}{2} + 1$	
x	y
-2	
-1	
0	
1	
2	



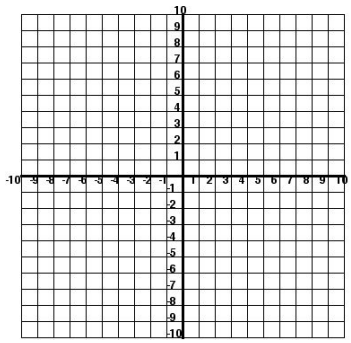
21. $y = \frac{4}{3}x - 2$

$y = \frac{4}{3}x - 2$	
x	y
-2	
-1	
0	
1	
2	



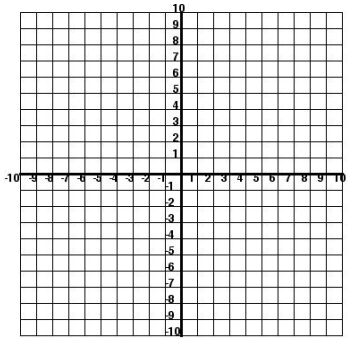
22. $y + 3 = x$

$y + 3 = x$	
x	y
-2	
-1	
0	
1	
2	



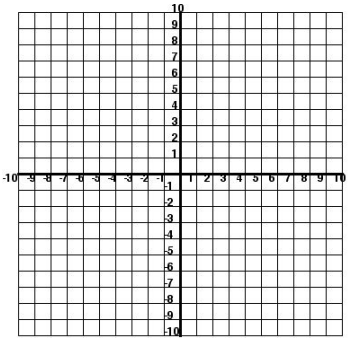
23. $2x + 3y = 12$

$2x + 3y = 12$	
x	y



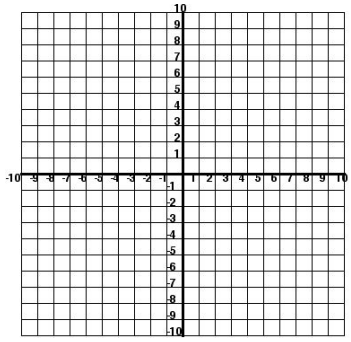
24. $\frac{1}{3}y - x = 1$

$y =$	
x	y



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

$y =$	
x	y



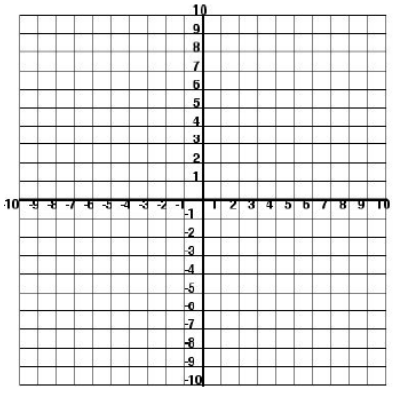
6) linear & non-linear graphing

	Linear Equations	Non-Linear Equations
Shape of Graph		
Variables Present		
Exponents on Variables		
Examples		

Example #1: Graph the following relations (using any method you choose: table of values, intercepts, or slope), and circle whether they are linear or non-linear.

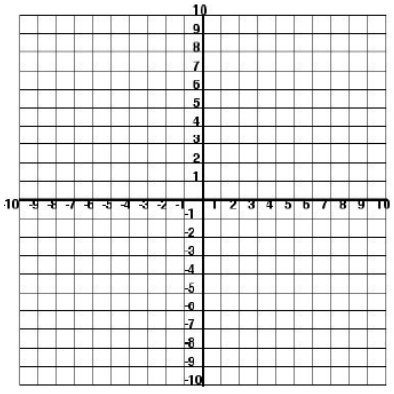
a) $y = 2x + 4$

Linear: YES or NO



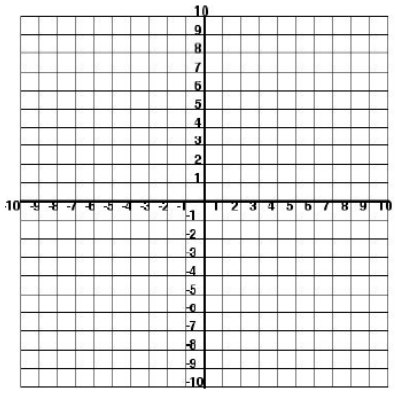
b) $y = -x^2$

Linear: YES or NO



c) $y = 2\sqrt{x} + 5$

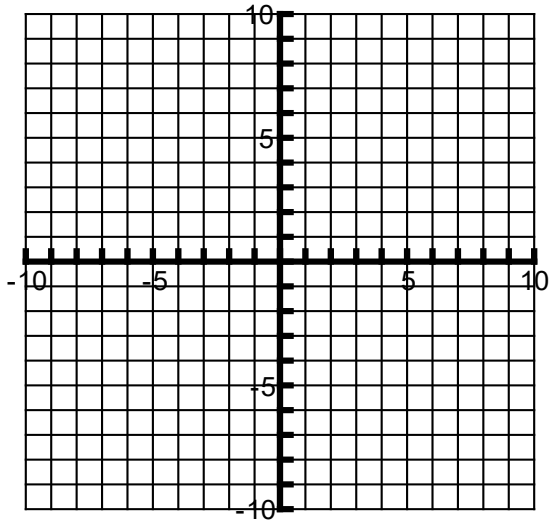
Linear: YES or NO



Example #2: Graph the line $\mathbf{9x + 2y = 18}$

x-intercept:

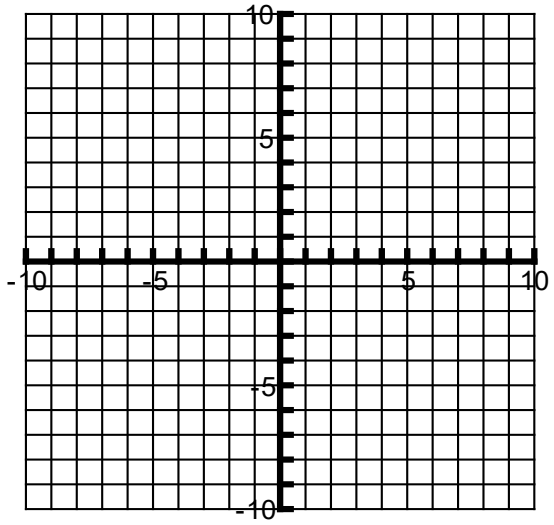
y-intercept:



Example #3: Graph the line $\mathbf{-6x + 5y + 30 = 0}$

x-intercept:

y-intercept:



Example #4: Determine the intercepts of the following relations. As well, circle whether the relation is linear.

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

Linear: YES or NO

b) $y = x^2 - 9$

Linear: YES or NO

Homework

assignment # 6
pages #11-17 questions #26-63

Graphing Equations: A review from above.

Using a Table of Values:
Step 1: Choose appropriate values of 'x' to put in the table.
Step 2: Input each 'x' into the equation to find the corresponding 'y'.
Step 3: Plot the new-found 'ordered pairs'.
Step 4: Draw a line through the points. (be careful of the shape…not all are lines)

In this unit, we will be studying graphs of straight lines and their equations.

We call these **LINEAR EQUATIONS.**

An equation is said to be ***linear*** if it forms a straight line when graphed.

Equation of a Line Property:

The coordinates of every point on the line will satisfy the equation of the line.

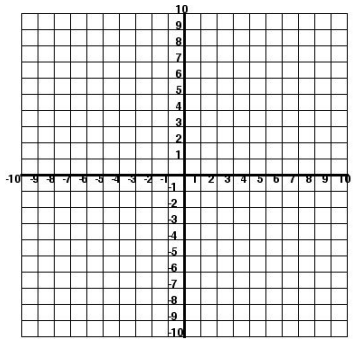
You should REALLY memorize this!

26. How many points do you need to graph a line?

27. To be safe, at least how many should you have?

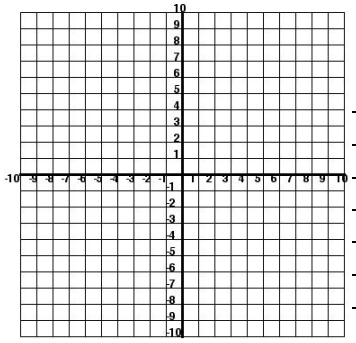
Graph these equations…

28. $y = -3x - 1$



x	y

29. $y = 5 + x$



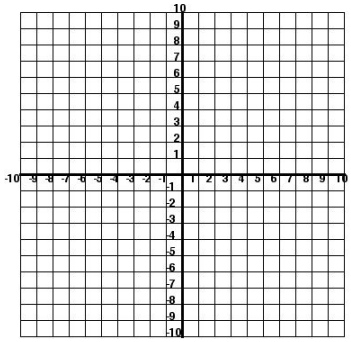
x	y

Graph the following equations, then determine if they are linear or not.

30. $y = -2x - 4$

$y = -2x - 4$	
x	y
-2	
-1	
0	
1	
2	

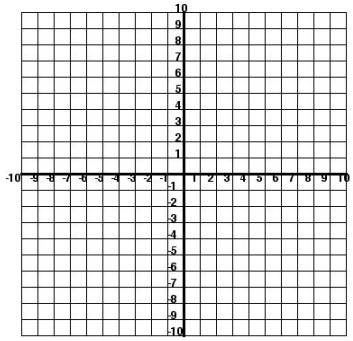
Linear: YES or NO



31. $y = x^2$

$y = x^2$	
x	y
-2	
-1	
0	
1	
2	

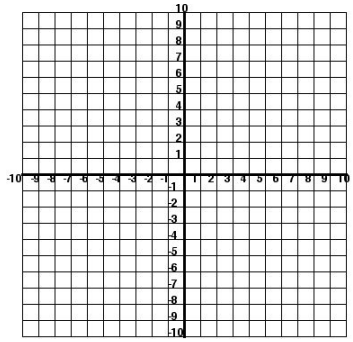
Linear: YES or NO



32. $y = 5x$

$y = 5x$	
x	y
-2	
0	
1	
4	
9	

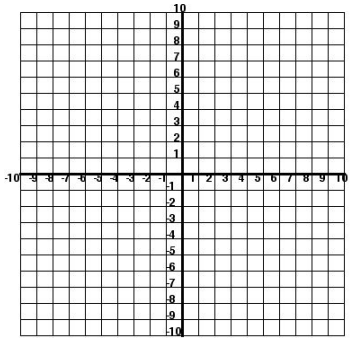
Linear: YES or NO



33. $y = x^3$

$y = x^3$	
x	y
-2	
-1	
0	
1	
2	

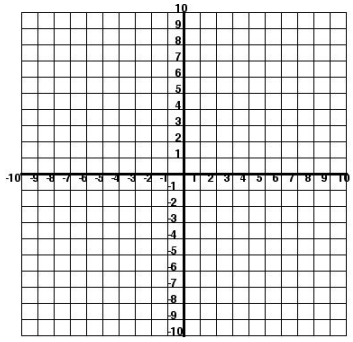
Linear: YES or NO



34. $y = -2x^2 + 6$

$y = -2x^2 + 6$	
x	y
-2	
-1	
0	
1	
2	

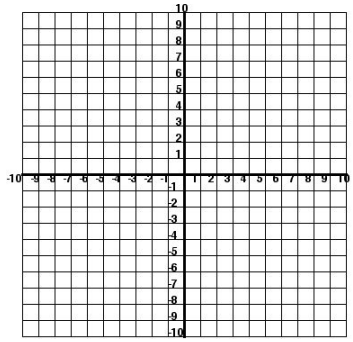
Linear: YES or NO



35. $y = \sqrt{x}$

$y = \sqrt{x}$	
x	y
-2	
-1	
0	
1	
2	

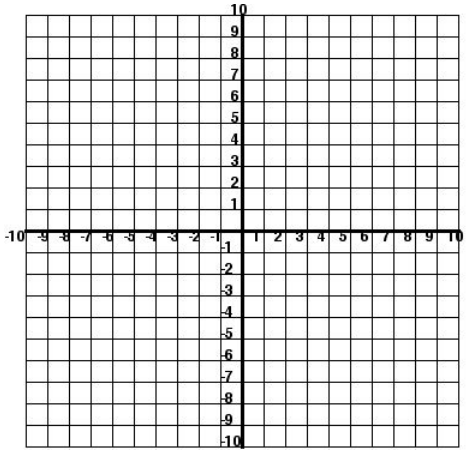
Linear: YES or NO



36. Can you describe a "rule of thumb" that will enable you to tell if an equation represents a linear equation or not?

Challenge #3:

The equation $2x + 4y = 16$ is a **linear equation.**



37. Find the coordinates of the point where the line crosses the y-axis. (Think…what would be the value of 'x' here?)

38. What is the value of 'x' where the line crosses the y-axis?

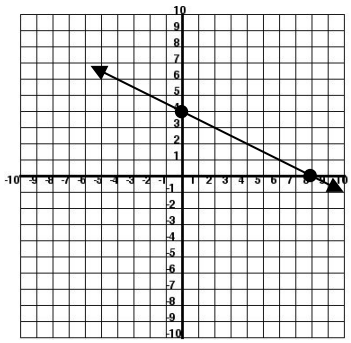
39. Find the coordinates of the point where the line crosses the x-axis.

40. What is the value of "y'" where the line crosses the x-axis?

Intercepts

The location where a line passes through the *x*-axis is called the ***x*-intercept**. This point will have the coordinates $(x, 0)$

The location where a line passes through the *y*-axis is called the **y-intercept**. This point will have the coordinates $(0, y)$
Consider: $2x + 4y = 16$



This line has an x-intercept at (8, 0).
And a y-intercept at (0, 4).

You may see this written as:
x-intercept is 8
y-intercept is 4

Calculating intercepts from an equation:

The x-intercept will have coordinates (*x*, 0). This means we can substitute 0 in for *y* and solve to find the x-intercept. The y-intercept will have coordinates (0, *y*).

Eg. Find the x-intercept for $2x + 4y = 16$

$2x + 4(0) = 16$
$2x = 16$
$x = 8$

Find the y-intercept: $2x + 4y = 16$

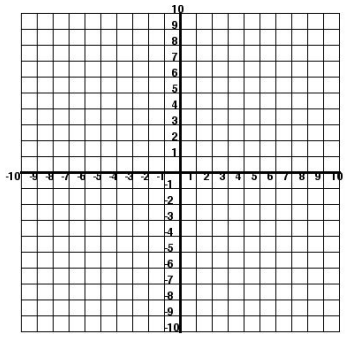
$2(0) + 4y = 16$
$4y = 16$
$y = 4$

Intercepts can be expressed as ordered pairs or simply as values.
For the example above, the x-intercept is 8 or the x-intercept is (8,0).

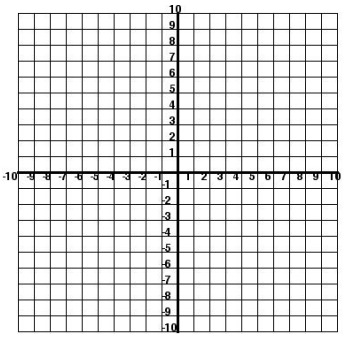
Some notes here…

Calculate the intercepts and graph each equation using them. Fractions can be estimated on the grid.

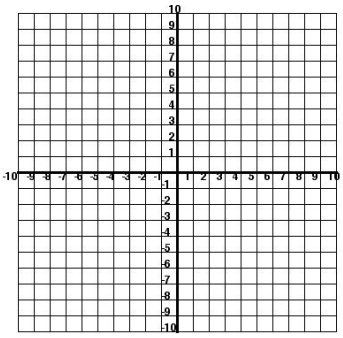
41. $2x + 3y = 12$



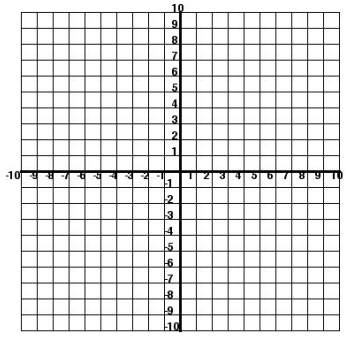
42. $3x + 5y = 30$



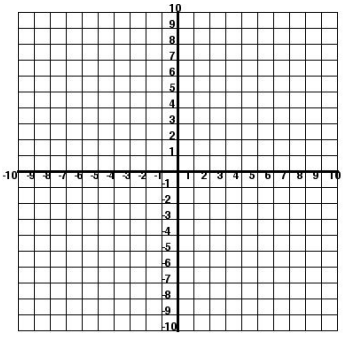
43. $3x - 4y + 24 = 0$



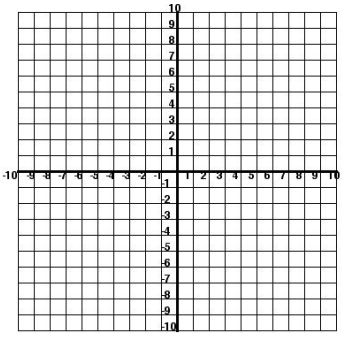
44. $4x + 5y = 20$



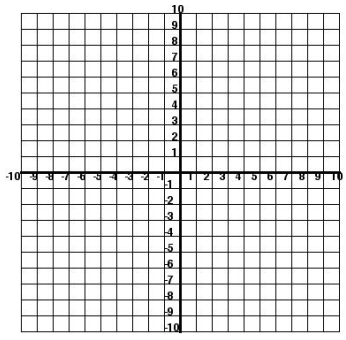
45. $6x - 3y - 18 = 0$



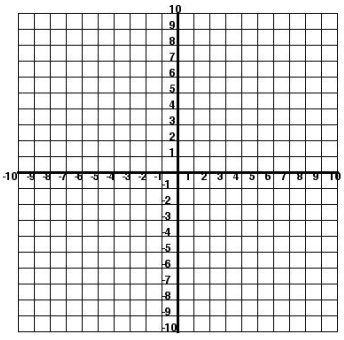
46. $3x - 7y = 21$



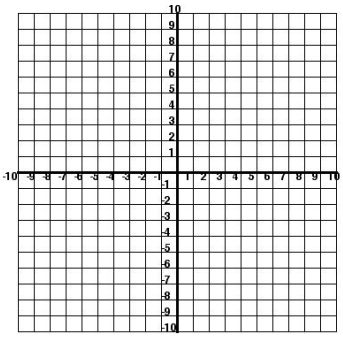
47. $4x + 5y = 10$



48. $9x + 3y - 18 = 0$



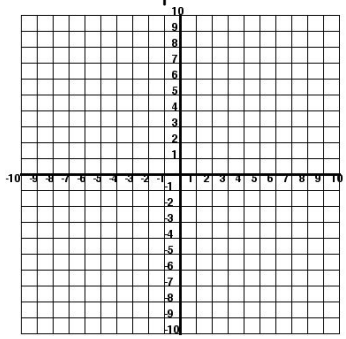
49. $3x - 2y = 9$



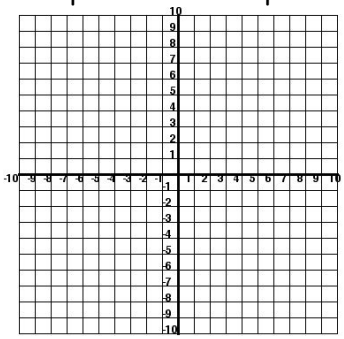
50. When do you think it would be appropriate (or the best scenario) to graph a line using the intercepts as opposed to using some other technique?

Answer the following questions about intercepts and linear relations. For these questions the domain is all real numbers.

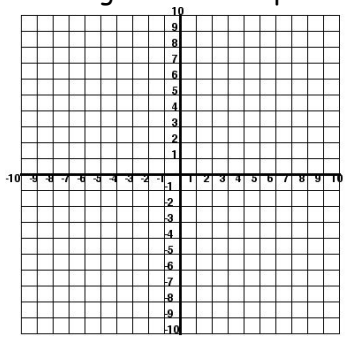
51. Draw a graph of a linear relation that has two intercepts.



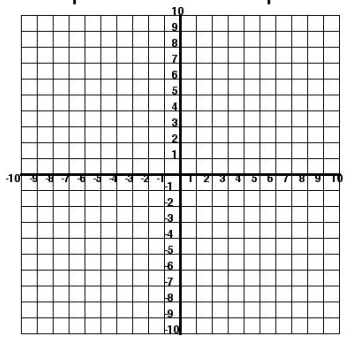
52. Draw a graph of a linear relation that has two positive intercepts.



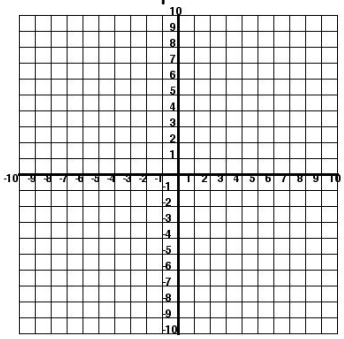
53. Draw a graph of a linear relation that has two negative intercepts.



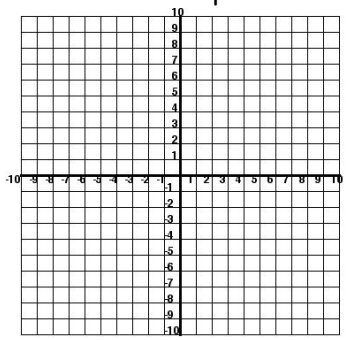
54. Draw a graph of a linear relation that has one negative and one positive intercept.



55. Draw a graph of a linear relation that has an infinite number of intercepts.



56. Draw a graph of a linear relation that has only one intercept.



57. Consider your answer to the previous question. What other **type** of line could you draw that would satisfy the problem?

58. Find the intercepts of the following linear equation.

$$\frac{x}{2}+\frac{y}{3}=1$$

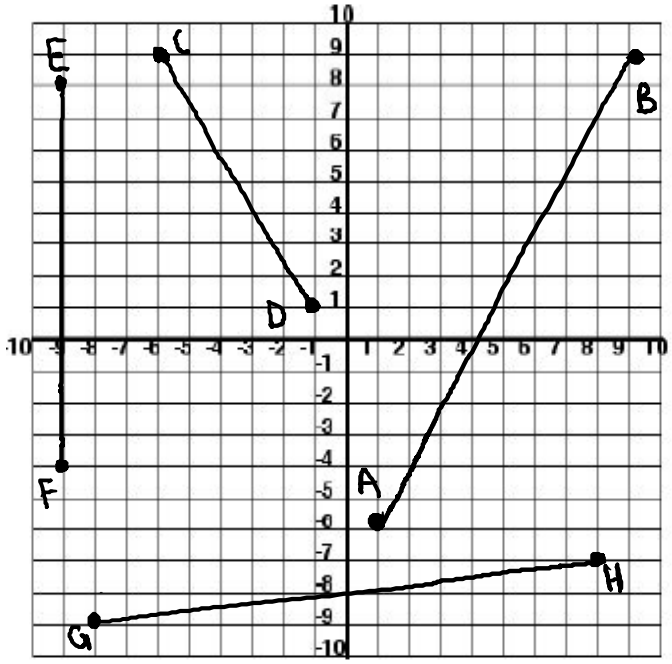
59. Find the intercepts of the following **non**-linear relation.

$$y=x^2-4$$

7) slope & points on lines

Warm-Up:

1. Determine the slopes of the following lines:

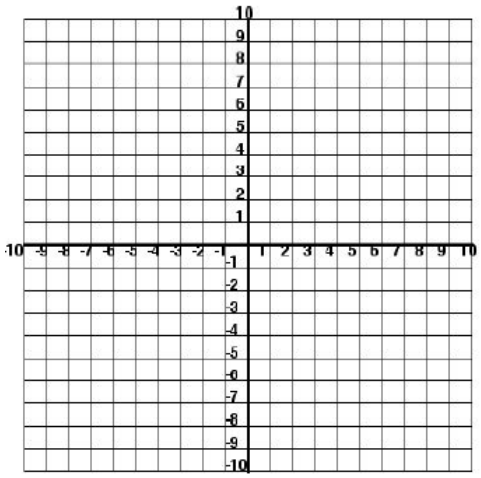


Line Segment	Slope
AB	
CD	
EF	
GH	

2. On the grid, draw a line through the point (-4, 2) with the following slope:

   a) Parallel to $-\frac{2}{3}$

   b) Perpendicular to $-\frac{2}{3}$



3. Compute the slopes of the following line segments, using the coordinates provided:

   a) AB

   b) CD

A (1, 8)	**C** (2, 5)
B (7, 11)	**D** (6, 2)

4. A line has a slope of $\frac{9}{7}$. It passes through (-1, -4) and (x, 5). Find the value of x.

5. The slope of a line is $-\frac{7}{5}$. The line passes through the point (-1, 3). Find the coordinates of another point on the line.

Part 1: Linear Relations

Linear Relations have a _____ rate of change/slope.

Example #1: Determine whether the following relations are linear.

a)

x	y
4	10
6	16
8	22
10	28

Linear: YES or NO

Slope:

b)

x	y
5	8
10	7
15	6

Linear: YES or NO

Slope:

c)

x	y
1	-9
2	-6
3	-1
4	6

Linear: YES or NO

Slope:

Part 2: Finding the Slope from an Equation

To find the slope from an equation, always change the equation to be in the form $y = mx + b$.

Example #2: Find the slope of the following lines (without graphing).

a) $y = -4x + 7$

b) $3x - 2y = -18$

c) $y - 2 = \frac{1}{4}(x + 3)$

Part 3: Determining if Points are on a Line

If a point falls on a line, it must 'satisfy' the equation of the line (ie: it must fit into the equation and remain equal)

Example #3: Do the following points fall on the line $2x + 5y = 20$?

a) (5, 2)

b) (-5, 6)

c) (4, 0)

d) (0, 4)

Example #4: Do the following points fall on the line $y = -x^2$?

a) (2, -4)

b) (-3, 9)

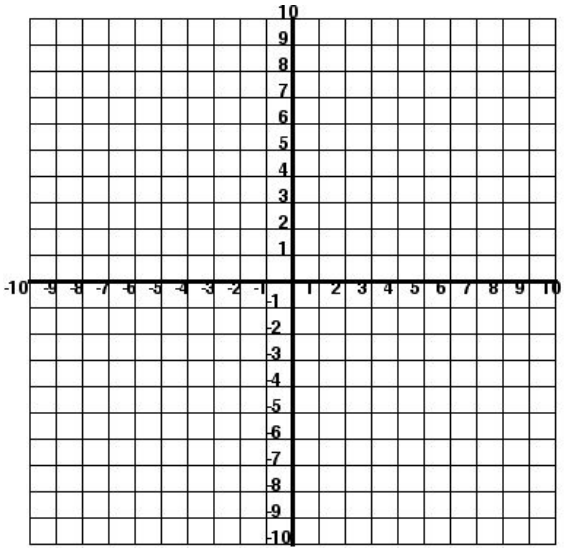
c) (-9, -81)

assignment # 7
pages #18-24-questions #64-97

Slope of a Line

Challenge #4:

60. Plot the following points:
$(-1,-5), (2,-4), (5,-3), (8,-2)$



61. Draw a line through the points you plotted.

62. Choose three sections of the line you just plotted and find their slopes.

Slope of section 1:

Slope of section 2:

Slope of section 3:

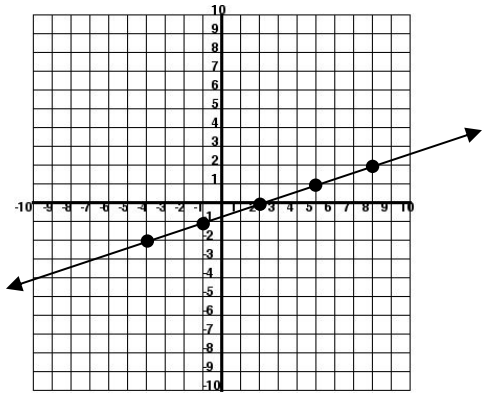
63. What do you notice?

Some notes here…

Slope of a Line

Recall from our discussion of line segments that slope can be calculated using: $\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$ or $\frac{rise}{run}$

For a straight line, the slopes of all segments on the line are equal. That is, if you find the slope of any two parts of the line, they will be equal.



Pick any three segments of the line and calculate the slope.

Slope will always be $\frac{1}{3}$.

The equations discussed earlier in this booklet result in lines that continue in two directions. Working with slope allows us to extend the line if we need to.

Remember:

- Parallel lines have equal slopes.
- Perpendicular lines have slopes that are negative reciprocals.

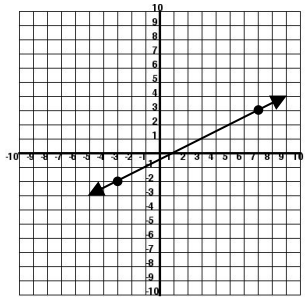
64. Find the slope of the line represented by the equation $y = 3x - 5$.

65. Find the slope of the line represented by the equation $2x + 5y = 20$.

66. Find the slope of the line represented by the equation $y - 4 = 3(x - 5)$.

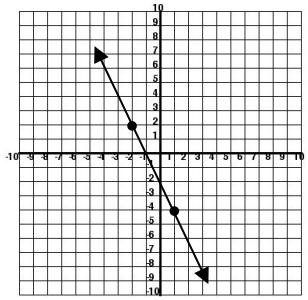
67. Find the slope of the line represented by the equation $\frac{1}{3}(x + 2) = y - 1$.

68. Find the slope of the line below.



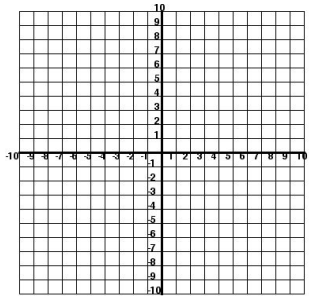
Slope is _____

69. Find the slope of the line below.

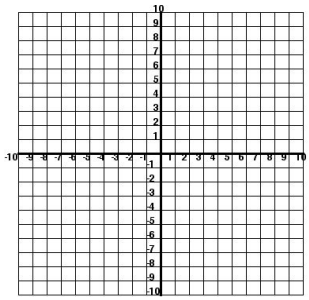


Slope is _____

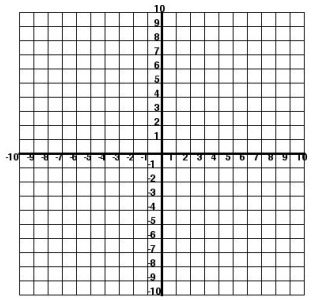
70. Draw a line through T(5,7) with slope $\frac{2}{5}$.



71. Draw a line through U(2, -2) parallel to the line in the previous question.



72. Draw a line through U(2, -2) perpendicular to the line in the question above.



73. If you were given a triangle with its vertices drawn as coordinates on an x-y coordinate plane, how could you determine if the triangle was a right triangle?

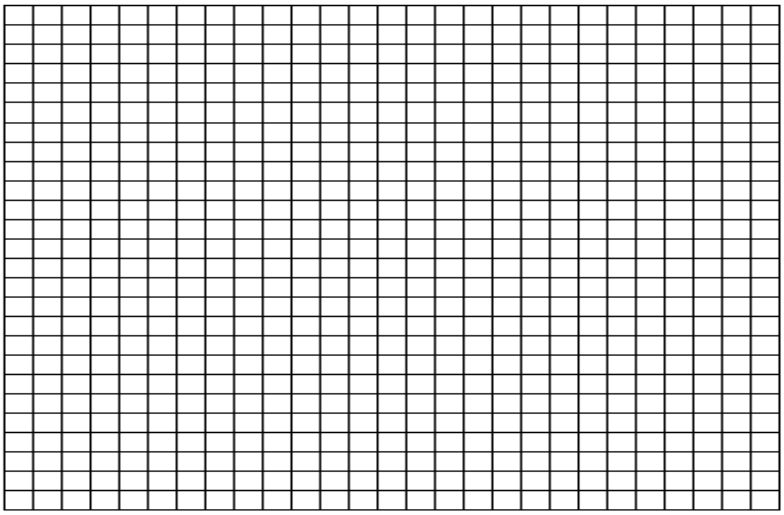
Do you know another way?

74. The slope of a line is $\frac{3}{2}$. If the line passes through point $B(5,2)$, find the coordinates of another point.

75. The slope of a line is -2.5. If the line passes through point $C(-1,2)$, find the coordinates of another point.

76. Julanya's internet provider charges a flat fee for the first 8 hr of access per month, plus an hourly rate for additional access. One month, 15 hr of usage cost her $25.88. The next month, 27 hr of access cost her $49.76.
a) Graph the data.

cost



Hours of usage

77. Find the hourly **rate** for access above 8 hr/month.

78. What word is synonymous with rate in this unit?

79. Find the flat fee for the first 8 hours. (Where will you find this value on the graph?)

Find the slope of the line passing through the points:

80. $(2,1)$ and $(6,6)$

81. $(-5,2)$ and $(4,2)$

82. $(-3,0)$ and $(3,-4)$

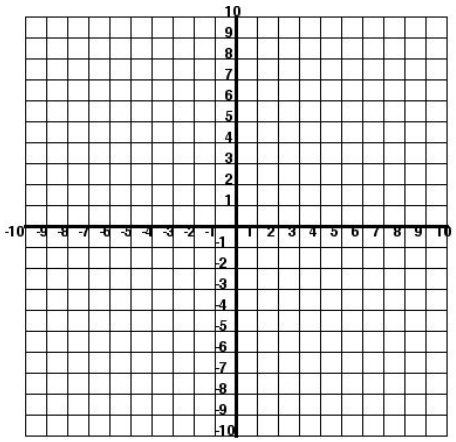
83. The slope of a line is -2. The line passes through (0,0) and (-3,y). Find the value of y.

84. A line has a slope of 1.5. It passes through (-2,1) and (x,7). Find the value of x.

85. **Challenge#5:** Show that (7, -1) is on the line $y = 2x - 15$

Algebraically:

Graphically:



The Equation of a Line

As you have seen, equations such as $2x + 3y = 12$ or $3y = x + 9$ or $y = \frac{5}{6}x - 4$ produce straight lines when graphed. They are **linear equations**.

Linear Equations may be written in several forms:

Slope-Intercept Form:	$y = mx + b$	$y = 3x + 2$
Point-Slope Form:	$y_2 - y_1 = m(x_2 - x_1)$	$(y - 2) = 3(x - 0)$
General Form:	$Ax + By + C = 0$	$3x - y + 2 = 0$

Recall the ***Equation of a Line Property:***

The coordinates of every point on the line will satisfy the equation of the line.

Eg.1. Show that (7, -1) is on the line $y = 2x - 15$

$y = 2x - 15$	If (7, -1) is on the line, it will satisfy the equation.
$(-1) = 2(7) - 15$	Substitue the ordered pair into the equation.
$-1 = 14 - 15$	Does the left side = right side?
$-1 = -1$	Yes. The point IS on the line.

Do you recall the "text box" like this on page 10?

Determine if the following points lie on the line $y = 2x + 4$ (HINT: substitution!)

86. (-10, 24)

87. (5,14)

88. (-7,-10)

Determine if the following points lie on the line $3x - 2y + 6 = 0$

89. (10, 18)

90. (0,-3)

91. (-6,-6)

92. Determine if the point $(2,-3)$ is on the line $y = 3x - 9$.

$-3 = 3(2) - 9$

$-3 = 6 - 9$

$-3 = -3$

Explain why or why not:

Yes, it is on the line because when the coordinates 2, -3 are substituted into the equation, left side and right side are equal.

93. Determine if the point $(-1,-4)$ is on the line $3x - 2y - 11 = 0$.

Explain why or why not:

94. Determine if the point $(2,-3)$ is on the line $y + 1 = \frac{3x}{2}$.

Explain why or why not:

95. Determine if the set of ordered pairs represents a linear relation.

$(2,3), (3,4), (4,5), (5,6)$

Explain why or why not:

96. Determine if the set of ordered pairs represents a linear relation.

$(1,1), (1,2), (1,3), (1,4)$

Explain why or why not:

97. Determine if the set of ordered pairs represents a linear relation.

$(2,1), (3,0), (4,-1), (5,-2)$

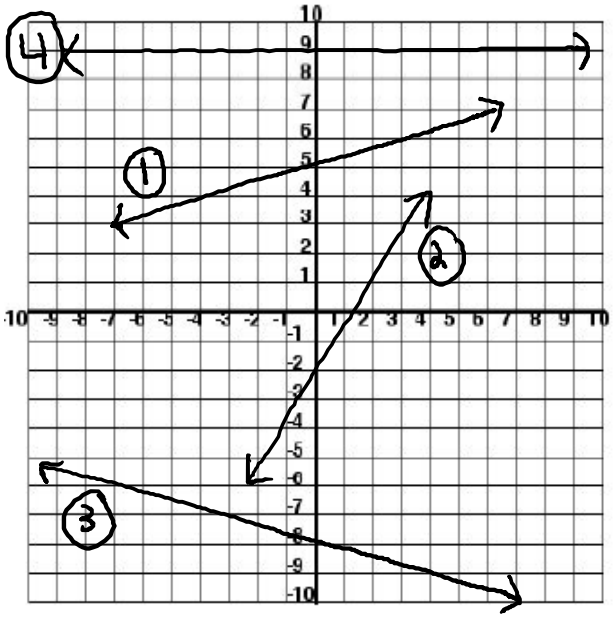
Explain why or why not:

8) slope-intercept form

Warm-Up:

1. Determine the slope, y-intercept, and equation of the following lines:

Line #	Slope	y-intercept	Equation
1			
2			
3			
4			



We say the equations above are written in ***slope-intercept form***. A general formula for an equation in slope intercept form is $y = mx + b$

The slope is the coefficient of *x*.

The *y*-intercept. (Make note of the sign)

Part 1: Using Slope Intercept Form

Example #1: Identify the slope and y-intercept for each of the following linear equations.

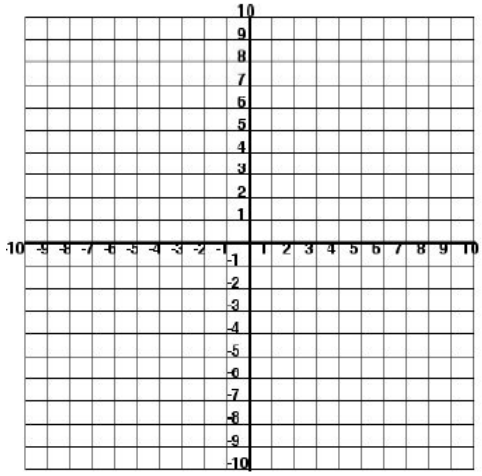
Linear Relation	Slope	y-intercept
a) $y = 42x + 15$		
b) $y = -\frac{9}{100}x - 72$		
c) $y = 5$		
d) $y = 22x + \frac{1}{3}$		
e) $y = x$		

Example #2: Write the equation of a line based on the following slopes and y-intercepts.

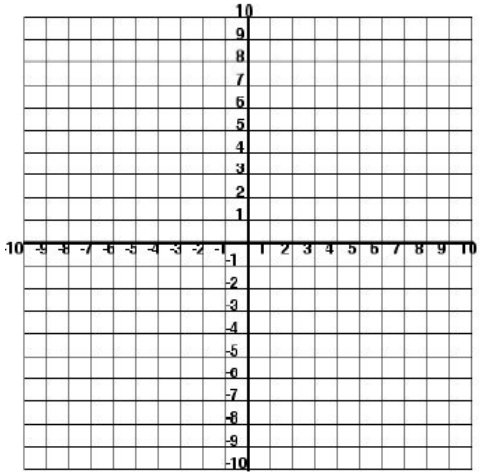
Linear Relation	Slope	y-intercept
a)	$-\frac{2}{3}$	7
b)	3	$\frac{1}{2}$
c)	$\frac{1}{6}$	-2

Example #3: Sketch a graph of the following equations. Make sure you have at least points on your graph!

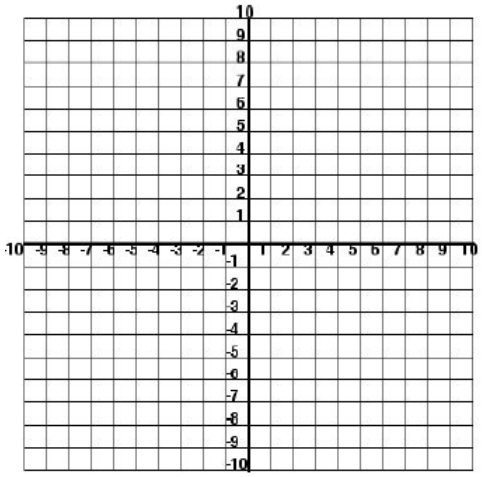
a) $y = \frac{1}{2}x + 3$



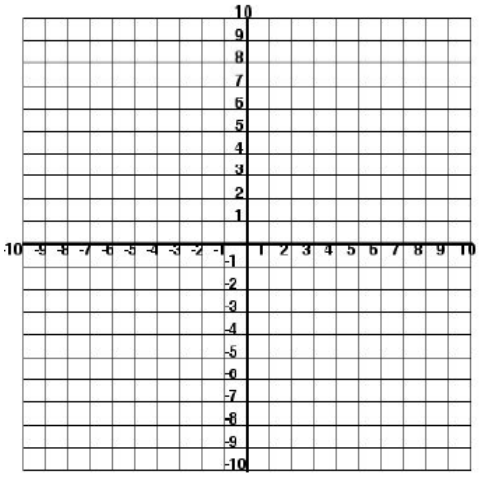
b) $y = -4x$



c) $2x + 4y = 8$



d) $\frac{x}{3} - \frac{2y}{6} = 2$



Part 2: Finding Missing Parts in the Equation of the Line

Example #4: Write the equation of a line where the slope is 10, and it passes through the following coordinates.

a) (3, 2)

b) (-6, 6)

c) (-1, 8)

Example #5: Write the equation of a line where the y-intercept is 3, and it passes through the following coordinates.

a) (7, 2)

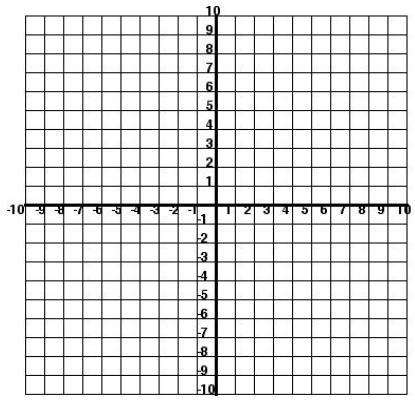
b) (-4, 11)

c) (9, 3)

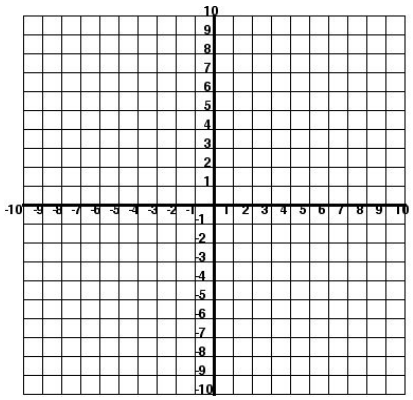
assignment # 8
pages #24-29 questions #98-137

Equation of a Line: Slope-Intercept Form

98. Graph the line $y = \frac{2}{3}x - 5$ using a table of values.



99. Graph the line $y = -3x + 5$ using a table of values.



100. What is the slope of the line above?

101. What is the slope of the line above?

102. What is the y-intercept of the line above?

103. What is the y-intercept of the line above?

104. Compare these values to the equation. What do you notice?

105. Compare these values to the equation. What do you notice?

We say the equations above are written in ***slope-intercept form***. A general formula for an equation in slope intercept form is $y = mx + b$

The slope is the coefficient of *x*.

The *y*-intercept. (Make note of the sign)

Remember, *x* and *y* are the coordinates of ANY point on the line. When substituted, they will satisfy the equation. See your work on the previous page!

State the slope and y-intercept for the line represented by each equation.

106. $y = -3x + 2$

107. $y = -\frac{3}{5}x - 7$

108. $y = \frac{9}{2}x - \frac{3}{2}$

Write the equation of each line given the slope and y-intercept.

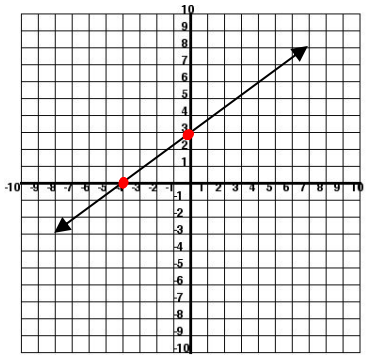
109. $m = 2$, $b = -5$

110. $m = \frac{7}{3}$, $b = \frac{2}{3}$

111. $m = -3$, $b = -2$

For each line below, state the slope, y-intercept, and equation.

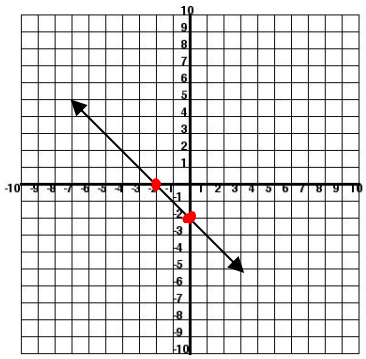
112.



slope_____
y-intercept_____

equation:

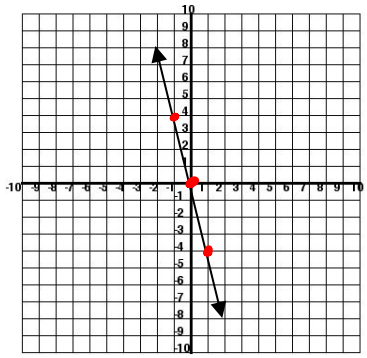
113.



slope_____
y-intercept_____

equation:

114.

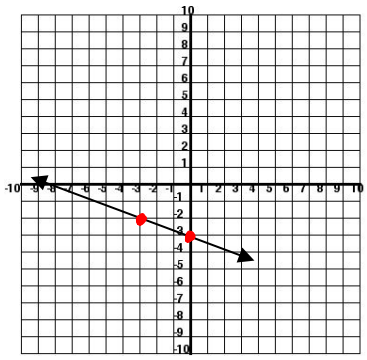


slope_____
y-intercept_____

equation:

For each line below, state the slope, y-intercept, and equation.

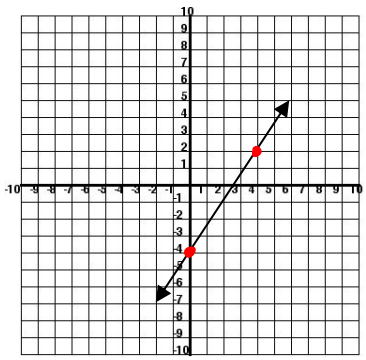
115.



slope_____
y-intercept_____

equation:

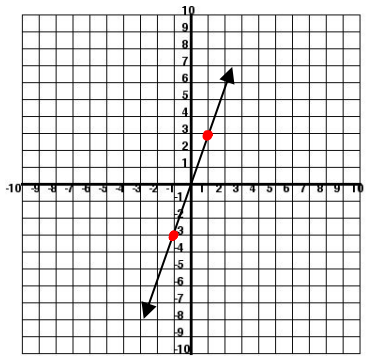
116.



slope_____
y-intercept_____

equation:

117.



slope_____
y-intercept_____

equation:

118. What do you notice about the **equation** of the lines passing through the origin?

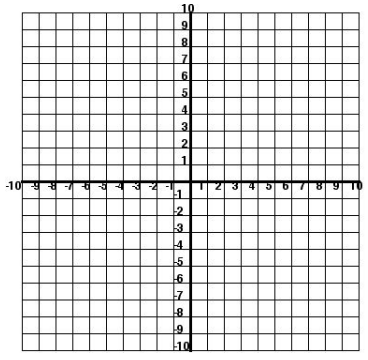
119. When is *b* positive?

120. When is *b* negative?

Graph the equations below by finding the slope and y-intercept from the equation.

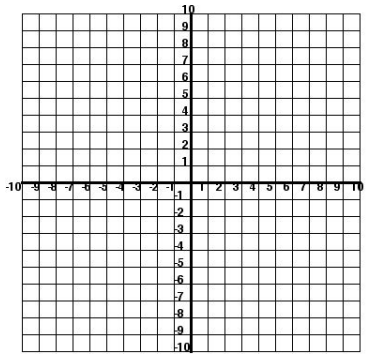
121.

$y = -3x$



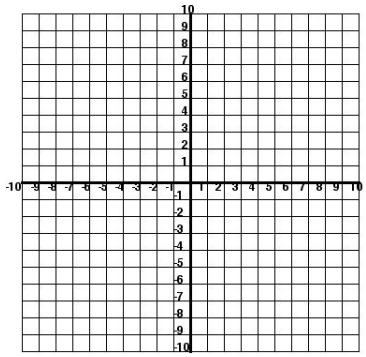
122.

$y = \frac{5}{2}x$

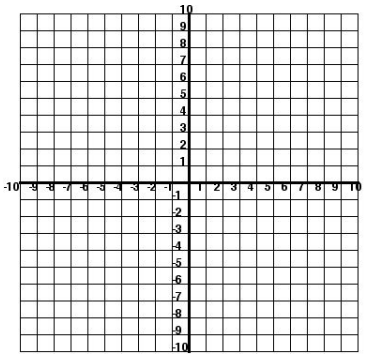


Graph the equations below by finding the slope and y-intercept from the equation.

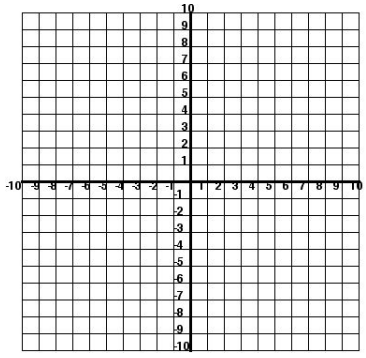
123. $y = -x + 3$



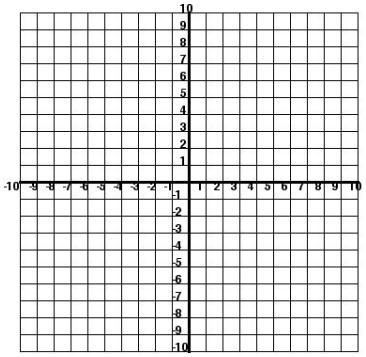
124. $2y = -10x + 12$



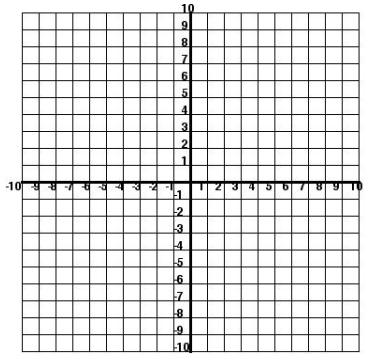
125. $y - 5 = \frac{1}{3}x - 3$



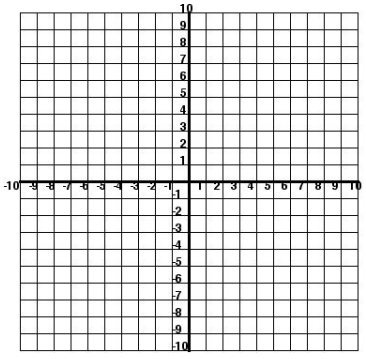
126. $2x - 5y + 20 = 0$



127. $\frac{x}{3} - \frac{y}{4} = 1$



128. $\frac{2x}{3} + \frac{3y}{4} = -6$



Determine the value of b for the equation $y = 3x + b$ if the line passes through the following points. Then write the equation in slope-intercept form.

129. $R(2,1)$

$y = 3x + b$

$1 = 3(2) + b$

$1 = 6 + b$

$-5 = b$

Therefore:

$y = 3x - 5$

130. $K(-1,4)$

131. $A(3,-2)$

132. $J(2,1)$

133. $T\left(-2,\frac{1}{2}\right)$

134. $L\left(\frac{2}{3},1\right)$

Determine the value of m for the equation $y = mx + 2$ if the line passes through the following points. Then write the equation in slope-intercept form.

135. $R(12,5)$

136. $K(1,-3)$

137. $A(-5,1)$

What you just did above is one way that you will be able to find the equation of a line. **IF** you have the _____ or the _____, you can input the _____ of a point on the line to solve for the unknown part of the equation.

Then you will write the full equation with _____ and _____ in place of *m* and *b*.

The following is another method.

9) equations of lines in three forms

The Three Forms of Writing Equations of Lines

1. Point-Slope Form:

2. Slope-Intercept Form:

3. General Form

Part 1: Writing the Equation of a Line in General Form

Example #1: Write the following equations in general form.

a) $y = 4x - 10$

b) $\frac{3}{4}y - 4 = 5x$

c) $1 = -\frac{2}{5}x + \frac{1}{2}y$

Part 2: Writing the Equation of a Line in Three Forms

Example #2: Use the following slope and point on the line to write the equation of the line in all three forms.

When you have a slope and a point, ALWAYS come up with your equations in this order:

1. Slope-Point Form
2. Slope-Intercept Form
3. General Form
4. Check: if you plug your point back into all three equations, does it work?

a) $m = 2$ (4, 7)

b) $m = -\frac{3}{4}$ (12, 4)

c) $m = -\frac{1}{3}$ (-6. 2)

d) $m = -\frac{2}{5}$ (4, -3)

assignment # 9
pages #30-35 questions #138-156

The Equation of a Line

The three forms

Slope-Intercept Form	Point-Slope Form	General Form
$y = mx + b$	$y - y_1 = m(x - x_1)$	$Ax + By + C = 0$
m is the slope b is the y-intercept	Derived from $m = \frac{y_2 - y_1}{x_2 - x_1}$ Cross multiply to get point-slope form. Need one point and slope	A must be positive. A,B,C are integers.

Write in general form.

138. $y = 3x - 5$	139. $y - 5 = x + 7$	140. $5 - 2x = -4y + 2$
141. $-\frac{1}{3}x - 4y = 2$	142. $y - 5 = \frac{2}{3}x + 7$	143. $5 = \frac{2}{3}y + \frac{3}{4}x$

144. Challenge #6

Write the equation of the line that passes through A(2,5) and has slope 3. Express your answer in general from and in slope intercept form.

The Equation of a Line

IMPORTANT!!! There is only one line that passes through a given point with a given slope.

Given the slope and a point:

Eg.1. A line passes through A(2,5) and has slope 3. Write the equation of the line.

Use the slope formula :

$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$	Cross-Multiply. This creates the Point-Slope form of an equation.
$\boldsymbol{m(x_2 - x_1) = y_2 - y_1}$	Fill in what you know. m = 3. Substitute the given point in for x_1 and y_1.
$3(x - 2) = (y - 5)$	This is our equation in **point-slope form.** We no longer need the subscripts on x and y
$3x - 6 = y - 5$	Expanded.
$3x - y - 1 = 0$	Collecting the terms to the left side is called writing the equation in **general form.**
Or	
$y = 3x - 1$	Isolate for 'y' to get the equation in **slope-intercept form**.

Write the equation of the line that passes through the given point and has the given slope. Express the equation in a) point-slope form b) general form c) slope-intercept form.

145. (-2,3), -2	146. (-5,2),2	147. (-5,-1),-2
$y-3=-2(x-$ $-2)$ $y-3=$ $-2(x+2)$ point-slope $y-3=-2x-4$ $y=-2x-1$ slope-intercept $2x+y+1=0$ general		
a) $y-3=-$	a)	a)

$2(x+2)$		
b) $2x+y+1=0$	b)	b)
c) $y=-2x-1$	c)	c)
148. (-3,4),$-\frac{1}{3}$	149. (2,4), $\frac{1}{2}$	150. (0,7), -1
a)	a)	a)
b)	b)	b)
c)	c)	c)

Write the equation of the line that passes through the given point and has the given slope. Express the equation in a) point-slope form b) slope-intercept form c) general form.

151. $(3,-6), m = -3$	152. $(4,6), m = 5$	153. $(-2,-1), m = \frac{1}{2}$
Start with Point-Slope formula: $y_2 - y_1 = m(x_2 - x_1)$ $y - -6 = -3(x - 3)$ $y + 6 = -3(x - 3)$ $y + 6 = -3x + 9$ $y = -3x + 3$ $3x + y - 3 = 0$		
a) $y + 6 = -3(x - 3)$	a)	a)
b) $y = -3x + 3$	b)	b)
c) $3x + y - 3 =$	c)	c)

$\mathcal{O}$		
154. $(5,-6), m = -\frac{3}{4}$	155. $\left(\frac{1}{2}, 6\right), m = \frac{4}{3}$	156. $(-2,1), m = 1.5$
a)	a)	a)
b)	b)	b)
c)	c)	c)

10) equations of lines in three forms...continued...

Remember! What are the three different equations of lines?

Example 1: Write the following equations in general form.

Remember: General form means NO _____ or _____,

The _____ ALWAYS has to be _____.

Order matters! Always write in this order: _____.

a) $-9x + 2 = -2y + 5$

b) $\frac{3}{4}y - 4 = 5x - 10$

c) $1 = \frac{-2}{5}x + \frac{1}{2}y$

Example 2: Write the equation of the line in all three forms.

a) $m = -3$ $(5, 2)$

b) $m = -\frac{2}{5}$ $(6, -1)$

Example 3: Write the equation of the line, in general form, that has the points (8, -2) and (6, 3).

Example 4: Write the equation of the line, in slope intercept form, that has the points (9, 5) and (-6, 4).

Example 5: Write the equation of the line, in general form, that has the points (-0.9, 0.2) and (-0.1, -0.8).

assignment # 10
pages #36-38 questions #157-165

157. Challenge #7:

Write the equation of a line in general form given that the line passes through $(3,4)$ and $(4,6)$.

Given two points:

When given two points we must first find the slope of the line. Then we will follow the same process as above.

Write the equation of the line that passes through (3,4) and (4,6).

$m = \frac{y_2 - y_1}{x_2 - x_1}$	Find the slope.
$m = \frac{6-4}{4-3} = \frac{2}{1} = 2$	The slope is 2.
$2 = \frac{y-4}{x-3}$	Substitute slope and **ONE** of the points.
$2(x-3) = y-4$	Cross-multiply. **Point-slope form**
$2x - 6 = y - 4$	Expand and simplify.
$2x - y - 2 = 0$	Write in general form.
$y = 2x - 2$	And in slope-intercept form if necessary.

Write the equation of the line that passes through the following two points in general form.

158. (3,4) and (4,6) Explain your reasoning

159. (-2, -4) and (0, 6)

Explain your reasoning

Write the equation of the line that passes through the following two points in general form.

160. (-5, -8) and (-7, -9)	161. (-1, -2) and (3,0)	162. (0,4) and (5, 0)
163. (8, -7) and (-6, -7)	164. $\left(\frac{2}{3},\frac{1}{4}\right)$ and $\left(\frac{1}{3},\frac{1}{3}\right)$	165. (0.3, 0.4) and (0.5, 0.7)

II) Working with Linear Relations

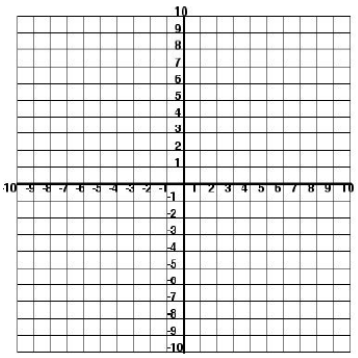
Part 1: Graphing a Line from an Equation

Recall the THREE ways we have to graph a line from an equation:

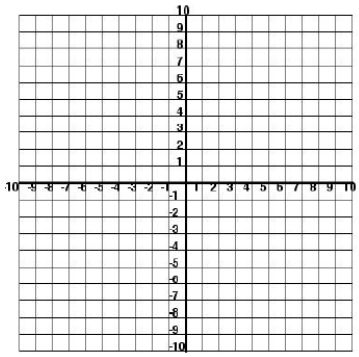
1. _____
2. _____
3. _____

Example 1: Graph the lines represented by the equation. Use any method you wish.

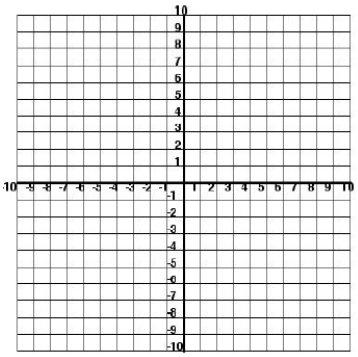
a) $3x - 2y = 12$



b) $y - x = 4$



c) $y = x^2 - 2$



Part 2: Describing Equations

Example 2: Represent the following in either equations or words.

Remember:

DOMAIN =

RANGE =

a) Represent the following statement with an equation:

Each element of the range is 4 less than triple the domain.

b) ***T or F***: Each element in the range is 2 more than one-fifth of the domain is represented by the following equation:

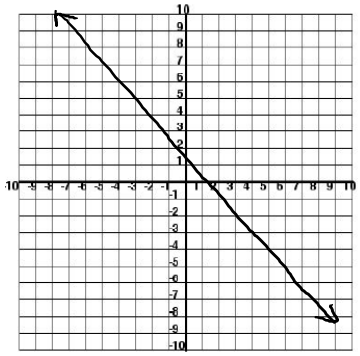
$$\mathbf{5y - x = 10}$$

c) Describe the following, in words, as a function:

$$\mathbf{2x - 2y = 20}$$

Part 3: Writing the Equation of a Line from a Graph

Example 3: Write the equation of the following line in slope-intercept form.

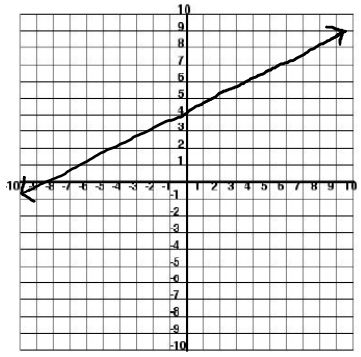


Here's How You Do It:

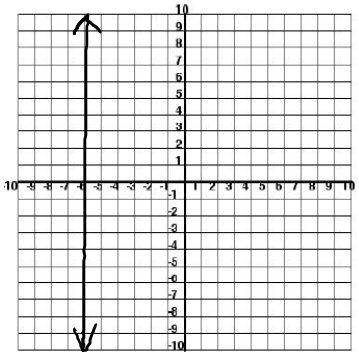
1. Pick out two points on the line
2. Find the _____
3. Plug the **slope** and **ONE point** into _____ ***OR*** plug the **slope** and the **y-intercept** (if it's a nice point) into _____
4. Transform your equation into the form asked.

Example 4: Write the equations of the following lines in general form.

a)



b)



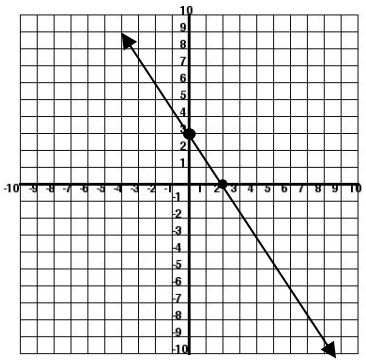
assignment # 11
pages #40-43 questions #166-188

Working With Linear Equations:

- Be able to convert equations between general form and slope-intercept form.
- Be able to graph equations given to you in either form.
- Be able to make comparisons based on parallel and perpendicular lines.

Eg.1. Graph the line $3x + 2y - 6 = 0$.

Your Options:
1) use intercepts 2)make a table of values 3)convert to slope-intercept form



I chose **option 1** because this equation allows for easy calculations to find both intercepts.

$3(0) + 2y - 6 = 0$ $2y - 6 = 0$ $2y = 6$ $y = 3$
The *y*-intercept is 3.

$3x + 2(0) - 6 = 0$ $3x - 6 = 0$ $3x = 6$ $x = 2$
The *x*-intercept is 2.

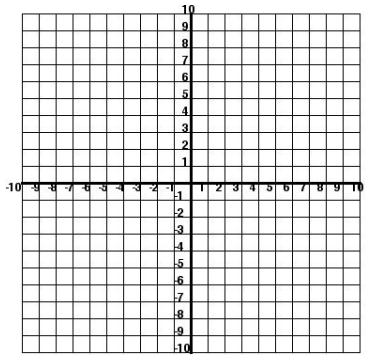
Plot the two points & draw the line through them.

My second choice would have been option 3, conversion to slope-intercept form.
$3x + 2y - 6 = 0$ $2y = -3x + 6$ $y = \frac{-3}{2}x + 3$

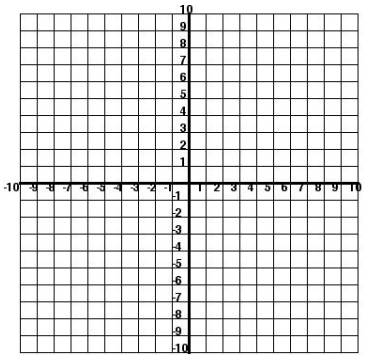
Plot the *y*-intercept then use the slope to plot another point, draw a line through the two points.

Graph the lines represented by each of the following equations. Use any method.

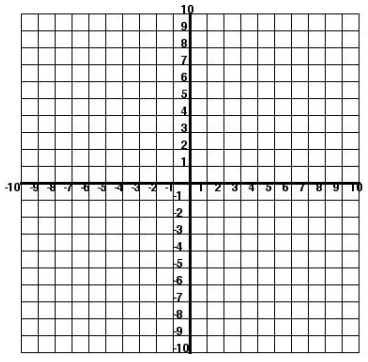
166. $3x + 2y + 6 = 0$



167. $5x + 2y - 10 = 0$

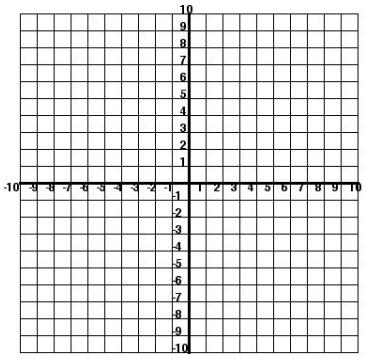


168. $x - y = 10$



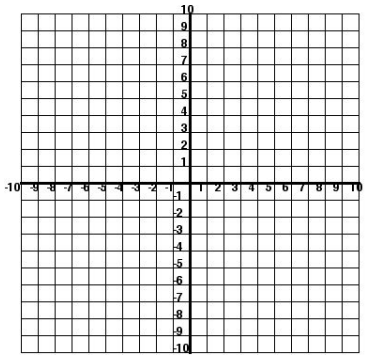
Graph the lines represented by each of the following equations. Use any method.

169. $3x + 2y - 4 = 0$



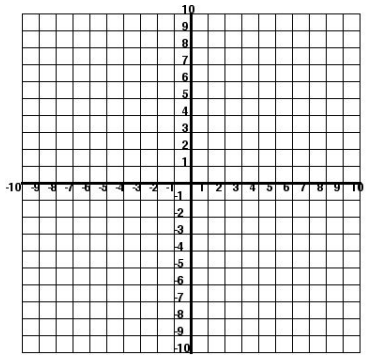
170. Explain your strategy:

171. $x - 4y = 0$



Explain your strategy:

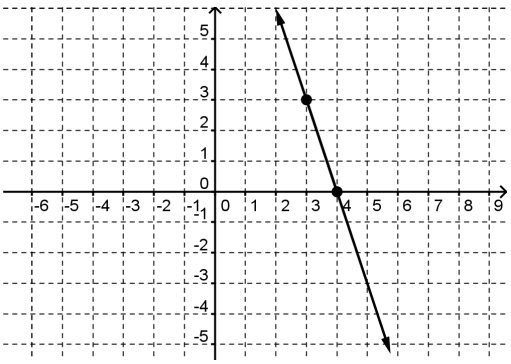
172. $2(x - 3) = y - 3$



Explain your strategy:

Match the following graphs to their corresponding equations. Choose the best match.

173.



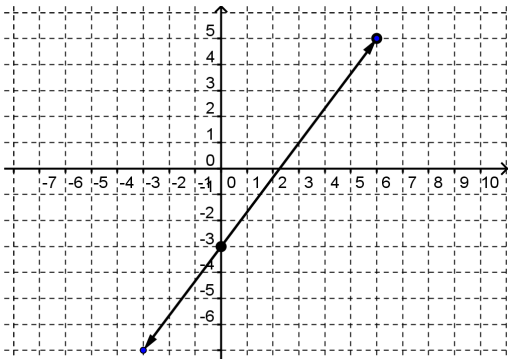
a) $x - 3y + 3 = 0$

b) $3x - y - 12 = 0$

c) $3x + y - 12 = 0$

d) None of the above

174.



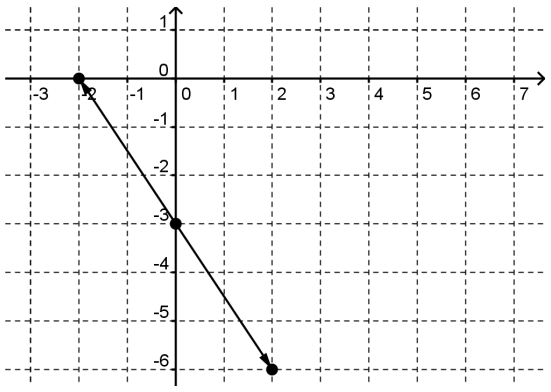
a) $4x - 3y + 9 = 0$

b) $3x - 4y + 9 = 0$

c) $3x + 4y - 9 = 0$

d) None of the above

175. Which equation on the right represents the graph below?



a) $2x - 3y + 6 = 0$

b) $3x - 2y + 6 = 0$

c) $3x + 2y + 6 = 0$

d) None of the above

176. Which of the following equations represents the word statement "each element of the range is equal to one less than double an element in the domain."

a. $2x - y - 1 = 0$
b. $x - 2y = -1$
c. $2x + y + 1 = 0$

177. Which of the following equations represents the word statement "each element of the range is equal to two more than one third an element in the domain."

a. $3x - y = 6$
b. $x - 3y = -6$
c. $x + 3y + 6 = 0$

178. Which of the following equations represents the word statement "triple each element of the range is equal to one less than double an element in the domain."

a. $2x - 3y = -1$
b. $2x - 3y = 1$
c. $2x + 3y = 1$

179. Write a "word statement" to describe the following equation.

$y = 3x - 2$

180. Write a "word statement" to describe the following equation.

$2x + 4y - 8 = 0$

181. Write a "word statement" to describe the following equation.

$3x - 5y = 20$

182. Which of the following equations represent the same line as $y = 3x - 2$?

Circle all that apply.

a. $3x = y + 2$
b. $3x - y - 2 = 0$
c. $y - 3x = -2$
d. none

183. Which of the following equations represent the same line as $5x - 2y + 10 = 0$?

Circle all that apply.

e. $y = \frac{5}{2}x + 5$
f. $\frac{2}{5}(x - 4) = y - 15$
g. $x = \frac{2}{5}y - 2$
h. none

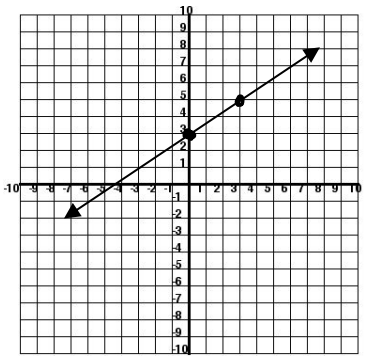
184. Which of the following equations represent the same line as $y - 4 = 2(x + 1)$?

Circle all that apply.

i. $2x - y + 6 = 0$
j. $y = 2x + 6$
k. $2x + y = 6$
l. none

Find the slope and *y*-intercept, write the equation in slope-intercept form, then in general form.

185.

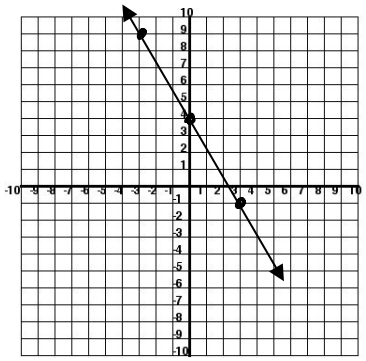


*m*_____ *b*_____

slope-intercept form_____

general form_____

186.

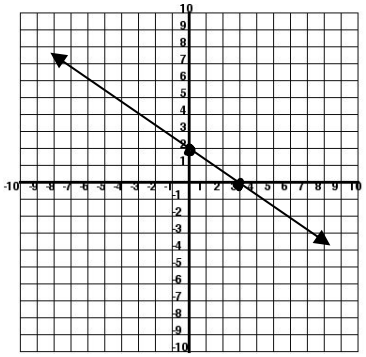


*m*_____ *b*_____

slope-intercept form_____

general form_____

187.

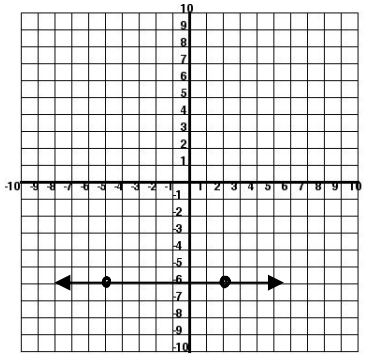


*m*_____ *b*_____

slope-intercept form_____

general form_____

188.



*m*_____ *b*_____

slope-intercept form_____

general form_____

12) parallel & perpendicular equations

We Always Need Two Pieces of Information to Write Equations:

1. _____
2. _____

REMEMBER:

Parallel:_____

Perpendicular: _____

Example 1: Write the equation of a line ***parallel*** to $2x - 4y + 3 = 0$ with the point $(5, 1)$ in general form.

Example 2: Write the equation of a line ***perpendicular*** to $5y - 15x = 1$ with the point $(7, -3)$ in general form.

Example 3: Write the equation of a line ***perpendicular*** to the line through $(7, 5)$ & $(10, 9)$ passing through the point $(-1, 8)$ in general form.

Example 4: Two ***perpendicular*** lines intersect on x axis. One line is $y = \frac{-1}{2}x + 5$ in general form.

Example 5: Write the equation of a line ***parallel*** to $-2y + x = 8$ with the same y-intercept as $10y + 32x = 100$ in general form.

assignment # 12
pages #43-48 questions #189-200

Parallel and Perpendicular Lines

Recall:

- Parallel lines have equal slopes.
- Perpendicular lines have slopes that are negative reciprocals.

For each line below, state the slope of a line that would be (a) parallel (b) perpendicular.

189. $y = 3x - 5$

a)

b)

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

a)

b)

191. $5x - 3y = 14$

a)

b)

192. CHALLENGE.

Write the equation of the line parallel to $5x - 8y + 12 = 0$ and through the point (-2,3).

SOLUTION to Q. 192.
Write the equation of the line parallel to $5x - 8y + 12 = 0$ and through the point (-2,3).

**Parallel means same slope. So we need to find slope of $5x - 8y + 12 = 0$.

$5x - 8y + 12 = 0$	Convert to slope intercept form.
$-8y = -5x - 12$	
$y = \frac{5}{8}x + \frac{12}{8}$	This gives us the slope. $m = \frac{5}{8}$
	Use the slope, $m = \frac{5}{8}$ and the point (-2,3) to write the equation.
$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$	Fill in what you know. $m = \frac{5}{8}$. Substitute point (-2,3)
$\frac{5}{8} = \frac{y-3}{x--2}$	Cross-Multiply.
$5(x + 2) = 8(y - 3)$	Simplify.
$5x + 10 = 8y - 24$	
$5x - 8y + 34 = 0$	General Form
$y = \frac{5}{8}x + \frac{17}{4}$	Slope-Intercept Form

193. Write the equation of the line parallel to $4x - 6y + 12 = 0$ and through the point (5,7).

Explain your reasoning

Eg.2. Write the equation of the line perpendicular to $3x + 2y - 4 = 0$ and through the point (2,3).

Perpendicular means slopes are negative reciprocals.
Step 1: Find the slope of $3x + 2y - 4 = 0$.

$3x + 2y - 4 = 0$ Convert to slope-intercept form.

$2y = -3x + 4$

$y = \frac{-3}{2}x - \frac{4}{2}$ This line has a slope, $m = \frac{-3}{2}$.

Negative reciprocal!

The perpendicular line will have a slope of $m = \frac{2}{3}$

Use: $m = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{2}{3} = \frac{y-3}{x-2}$ Fill in what you know. $m = \frac{2}{3}$. Substitute point (2,3)

$2(x - 2) = 3(y - 3)$ Cross-Multiply.

$2x - 4 = 3y - 9$ Simplify.

$2x - 3y + 5 = 0$ General Form

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

194. Write the equation of the line perpendicular to $4x + 3y - 24 = 0$ and through the point (1,4).

Eg.3.Write an equation for the line through C(2,4) that is perpendicular to the line through A(1,2) and B(4,8).

First find slope AB. $m = \frac{8-2}{4-1} = \frac{6}{3} = 2$ Therefore, the perpendicular line has slope, $m = \frac{-1}{2}$.

$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$ Fill in what you know: $m = \frac{-1}{2}$. & substitute point (2,4)

$\frac{-1}{2} = \frac{y-4}{x-2}$ Cross-Multiply.

$-1(x-2) = 2(y-4)$ Simplify.

$-x + 2 = 2y - 8$

$x + 2y - 10 = 0$ General Form

$y = -\frac{1}{2}x + 5$ Slope-Intercept Form

Know which of these forms you are being asked to answer in. If it is not specified, you can choose.

Both describe the same line.

195. Write an equation for the line through C(1,2) that is perpendicular to the line through A(2,4) and B(5,5).

Explain your reasoning

196. Write an equation for the line through Q(1,2) that is perpendicular to the line through R(-2,0) and S(3,5).

Determine the equation of the following lines. Answer in general form.

197. The line parallel to $2x - 3y + 1 = 0$ and passing through the point (1, 2).

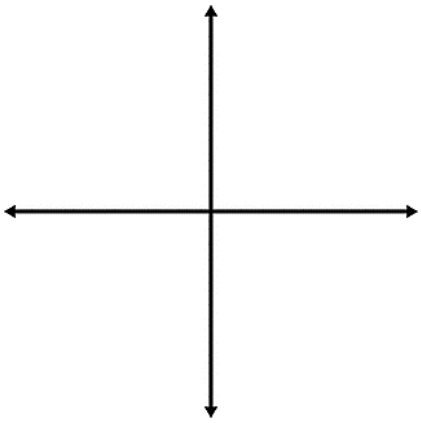
198. The line perpendicular to $x - 5y + 2 = 0$ and passing through the point (-2, 5).

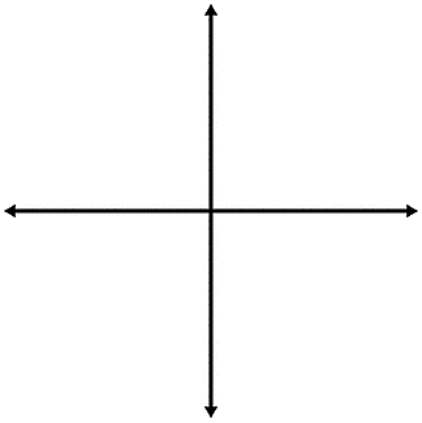
199. The line perpendicular to $3x - 12y + 16 = 0$ and having the same *y*-intercept as $14x - 13y - 52 = 0$.

200. Two perpendicular lines intersect on the *x*-axis. An equation of one line is $y = 3x + 9$ Find the equation of the other line.

13) Horizontal & vertical lines + mixed practice

Part 1: Horizontal & Vertical Lines



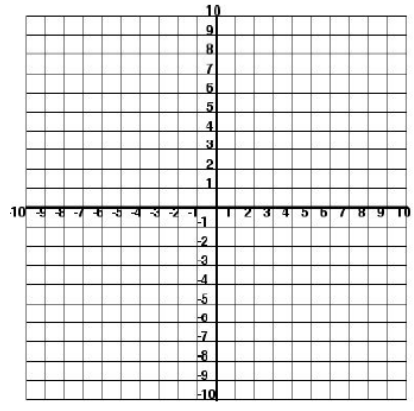


Equations: _____ _____

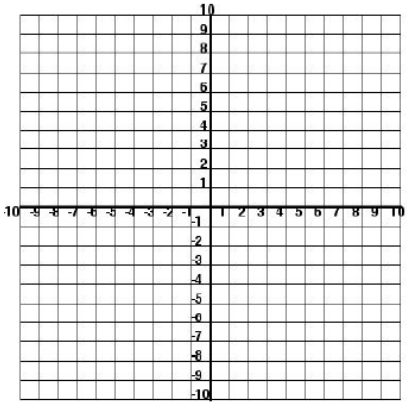
_____ _____

Example 1: Graph the following:

a) $3y - 6 = 0$



b) $5x + 10 = 0$



Part 2: Word Problems

Example 2: The slope of a line represented by $6x - ky + 1 = 0$ is $\frac{2}{3}$. Determine the value of k.

Example 3: Determine the equation of the line (in general form) of the diameter of a circle if the center is $(6, -2)$ and a point on the diameter is $(15, 3)$.

Example 4: The slope of a roof is $\frac{6}{12}$, and its height is 20 m. Calculate the total horizontal span of the roof.

Example 5: Anya is building a picnic table for her backyard. The slope of the table legs is 4 and the table height is 100 cm. Find the length of a table leg to the nearest cm.

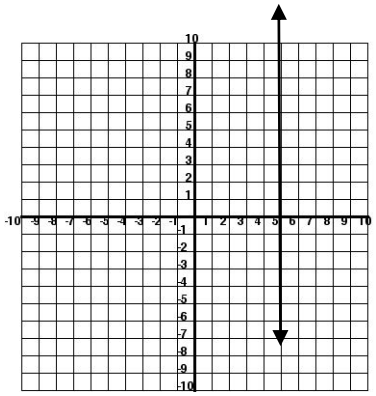
Homework

assignment # 13
pages #49- 56 questions #201-244 *(skip #241-242)*

Horizontal & Vertical Lines:

The equation of a horizontal line that is 3 units above the x-axis will be $\boldsymbol{y = 3}$ or $\boldsymbol{y - 3 = 0}$.
The equation of a horizontal line that is 12 units below the x-axis will be $y = -12$ or $y + 12 = 0$.

The equation of a vertical line 7 units to the right of the y-axis will be $\boldsymbol{x = 7}$ or $\boldsymbol{x - 7 = 0}$.
The equation of a vertical line 2 units to the left of the y-axis will be $x = -2$ or $x + 2 = 0$.

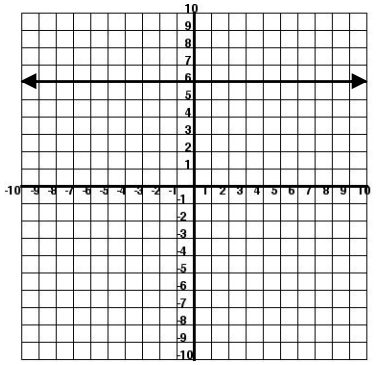


The equation of this line is $\boldsymbol{x = 5}$.

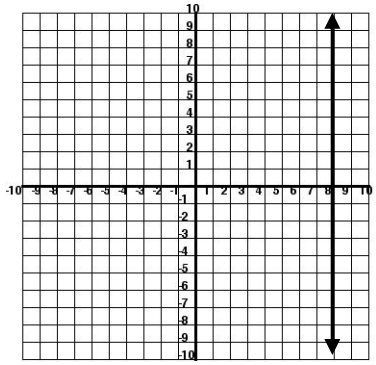
Think to yourself…
Every point on this line has an x-coordinate of 5.
It makes sense for the equation to be x=5.

Write the equation of the following lines.

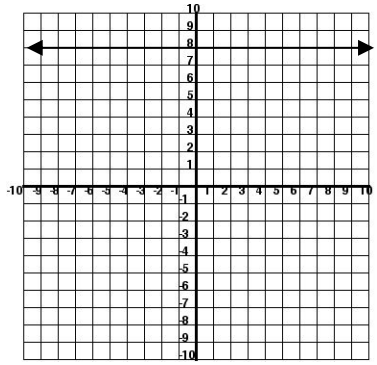
201.



202.

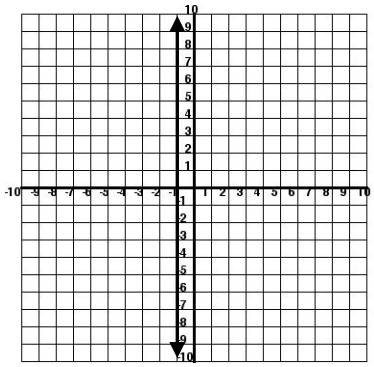


203.

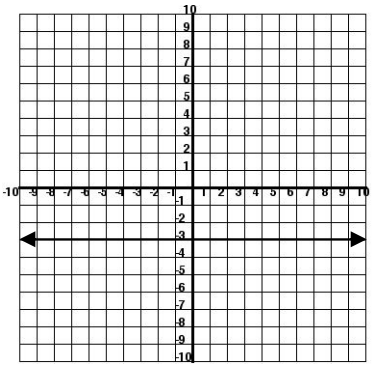


Write the equation of the following lines.

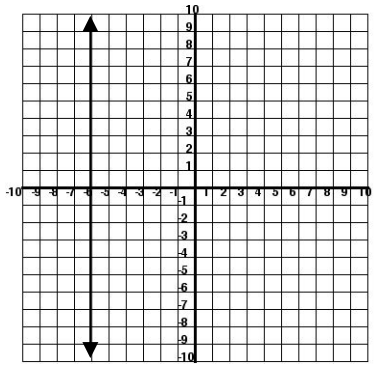
204.



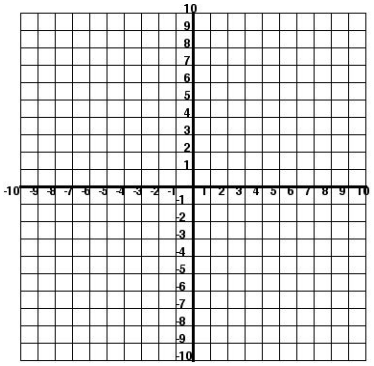
205.



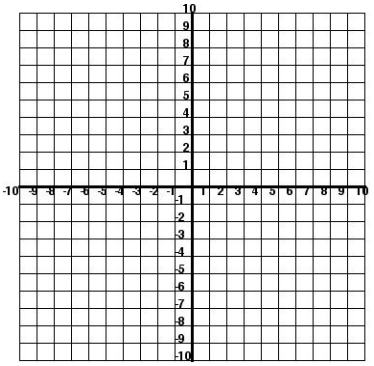
206.



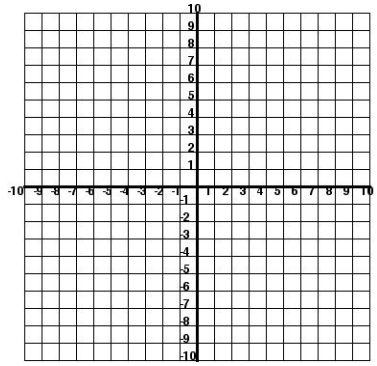
207. Graph the line represented by the equation $2y - 4 = 0$.



208. Graph the line represented by the equation $3x - 2 = 0$.



209. Graph the line represented by the equation $y - 4 = 2y - 10$.



Mixed Practice:

210. Which of the following equations represents the steepest line?

a. $5x + 4y - 12 = 0$
b. $6x + 2y = 14$
c. $-3x - 7y - 21 = 0$
d. $12x + 24y + 64 = 0$

211. Which of the following passes through $(9, -8)$ and has an x-intercept of -3?

a. $3x + 2y + 9 = 0$
b. $5x + 9y + 27 = 0$
c. $2x + 3y + 6 = 0$
d. $4x + 3y + 12 = 0$

212. What is unique about lines that are written in the form $x = a$.

213. What is unique about lines that are written in the form $y = b$.

214. What is the equation, in general form, of the line that passes through the point (6, -3) and is parallel to $y = \frac{2}{3}x + 4$.

215. Determine the slope of the line perpendicular to $x - 2y - 3 = 0$.

216. Determine the equation of the line that contains the diameter of the following circle.
Centre $(-4,3)$
Point on circumference $(2, -1)$

Answer in general form.

217. The slope of the line represented by the equation $8x - ky + 2 = 0$ is $\frac{2}{3}$.
Determine the value of k.

218. What is the equation of a line with undefined slope and an x-intercept of 5. Write your answer in general form.

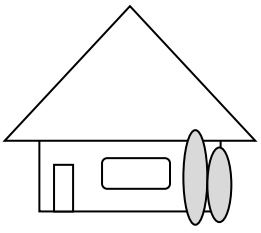
219. Write the equation $y = \frac{1}{5}x - 4$ in the form $Ax + By + C = 0$ where A is positive and all coefficients are rational numbers?

220. Find the value of k if $2x + ky + 7 = 0$ is parallel to $3x - 6y + 12 = 0$.

221. Find all of the following points that are on the line $3x = 2y + 24$?

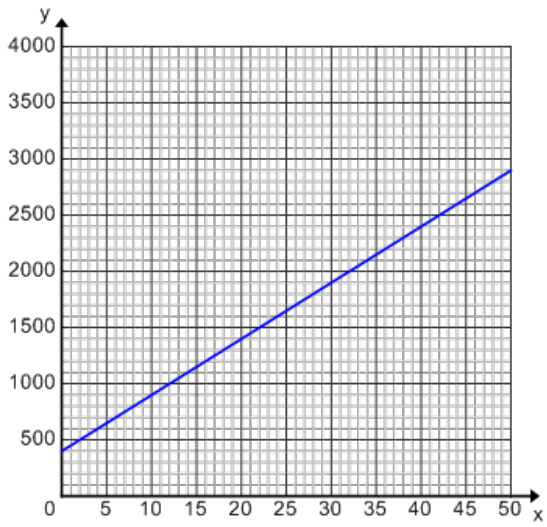
a. (8,0)
b. (6,-3)
c. (4,6)
d. (-2,9)
e. (0,-12)

222. The slope of the roof on Mr. J's hidden surf shack is $\frac{4}{3}$. If the roof is 14m tall, how wide is it?



223. Anya is building a picnic table for her backyard. The slope of the table legs is 2 and the table height is 90cm. Find the length of a table leg to the nearest cm.

224. Write an equation that represents the graph below.



225. What is a possible relationship for the graph (and equation) above?

226. Challenge#8

The equation $y = 75x + 1500$ represents the cost of a wedding reception. The total cost consists of $1500 fee to rent the hall plus $75 per guest. Express the equation of this relation using function notation.

Linear Functions

Function notation is used to show the relationship between two quantities.
The use of function notation allows the reader to identify the dependent and independent variable. Also, the letters chosen often identify what the variables represent.

Eg. The equation $y = 75x + 1500$ represents the cost of a wedding reception. The total cost consists of $1500 fee to rent the hall plus $75 per guest. Express the equation of this relation using function notation.

C(n) = 75n+1500 Cost is a function of the number of guests.

227. The cost of a taxi ride in Victoria is $5.25 plus $0.35 per kilometer. Write an equation using function notation for this relation.

228. J-Tees Pedi-Cabs provide tours for visitors to Victoria. The cost is 25 cents per minute. Write an equation using function notation for this relation (in dollars).

229. JLA-Skuterz rent gas-powered scooters. The cost is $40 per day plus 25 cents per kilometre ridden. Write an equation using function notation for this relation.

230. The skating rink at the recreation centre charges students $5.00 admission. Write an equation for the cost (C) as a function of the number of students (s).

231. The skating rink will let a group of students book the entire rink for $500. Write an equation for the cost (C) as a function of the number of students (s).

232. At the same skating rink, another option is to reserve the rink for $200 and then pay $4 per student. Write an equation for the cost (C) as a function of the number of students (s).

Find the range value for each of the following.

233. $C(n) = 25n + 12$
Find $C(12)$.

234. $f(x) = \frac{1}{2}x - 3$
Find $f(-3)$.

235. $h(t) = -250t + 1200$
Find $h(20)$.

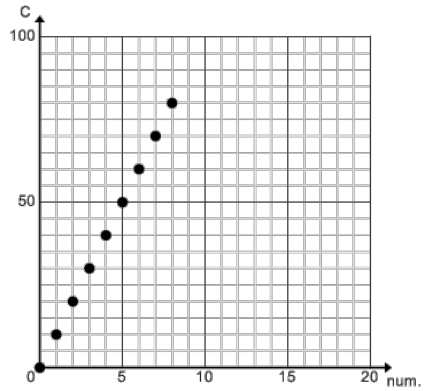
Find the domain value for each of the following.

236. $C(n) = 25n + 12$
Find n if $C(n) = 24$.

237. $f(x) = \frac{1}{2}x - 3$
Find x if $f(x) = 12$.

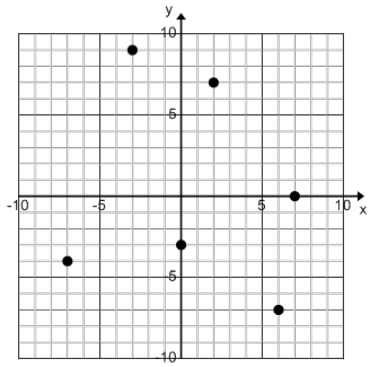
238. $h(t) = -250t + 1200$
Find t if $h(t) = 1000$.

239. Below is a graph of C(n).



Find $C(4)$.

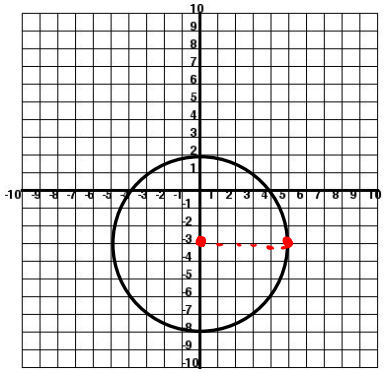
240. Below is a graph of f(x).



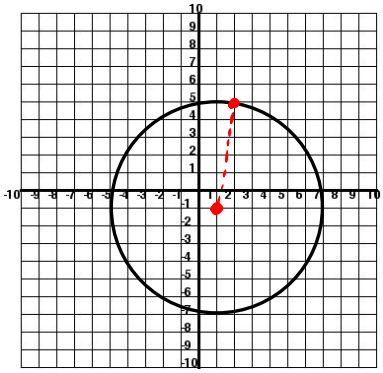
Find x if f(x) = 7.

Extended Practice

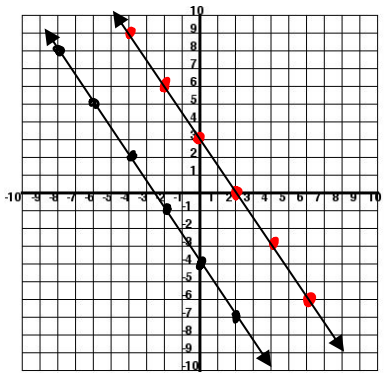
241. The centre of a circle is located at (0,-3). Draw a tangent at (5,-3). What is the equation of the tangent?



242. The centre of a circle is located at (1,-1). Draw a tangent at (2,5). What is the equation of the tangent?



243. Are the lines below parallel?

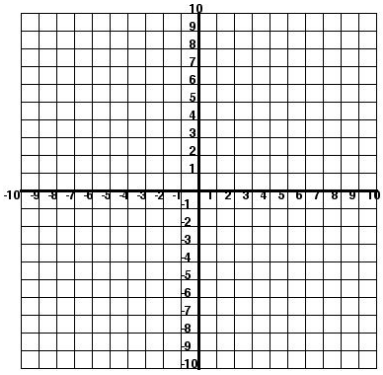


Explain how you know_____

_____

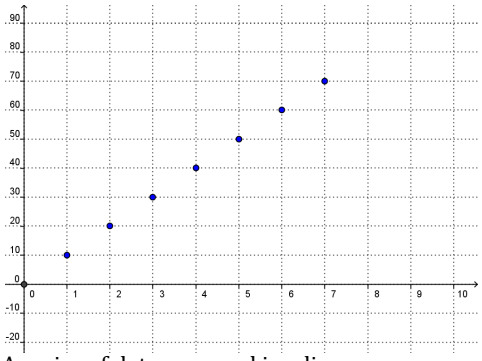
_____

244. Draw a line through A(1,2) and B(-3,-7). Now draw a perpendicular line through C(9,-3).

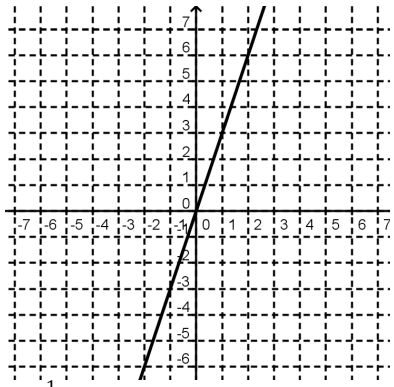
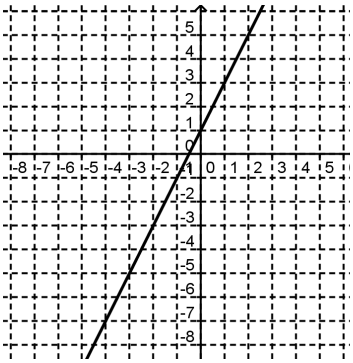
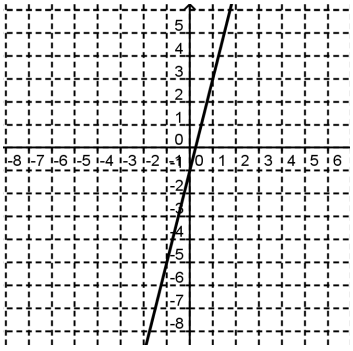
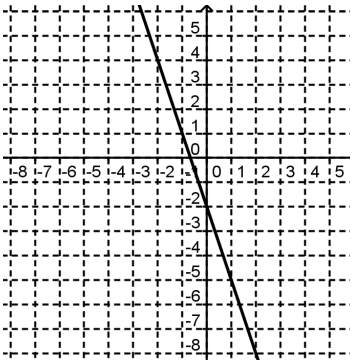
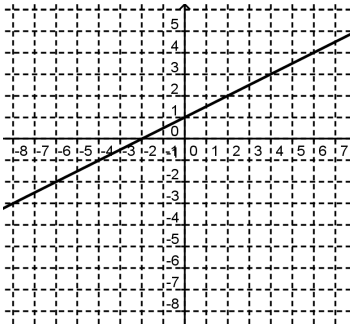


What is the equation of the perpendicular line?

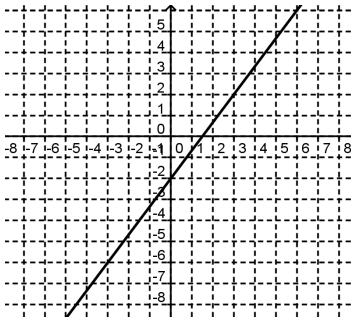
Part II Answers:

1. 
2. A series of dots arranged in a line.
3. Yes.
4. E, earnings.
5.

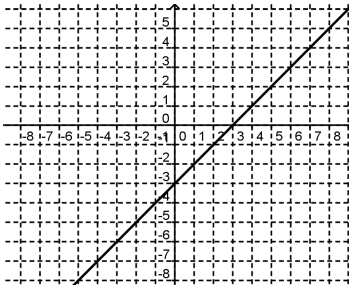
$y = 3x$	
x	y
-2	-6
-1	-3
0	0
1	3
2	6

6. Ordered pairs.
7. Yes, it makes the left side of the equation equal the right.
8. Infinite number.
9. You can draw a straight line through them.
10. 
11. $y = \frac{1}{2}x - 4$
12. $y = 2x - 3$
13. $y = \frac{3}{5}x + 4$
14. $y = \frac{2}{9}x - \frac{2}{3}$
15. $y = \frac{4}{3}x + 12$
16. $y = -\frac{4}{3}x + \frac{16}{5}$
17. 
18. 
19. 
20. 

21.



22.



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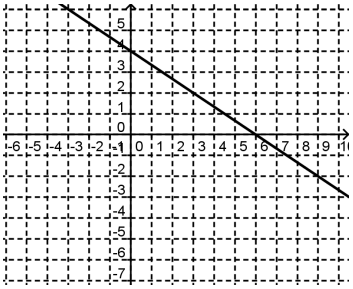

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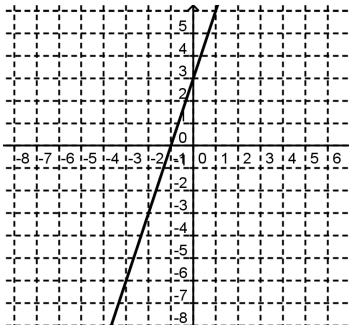
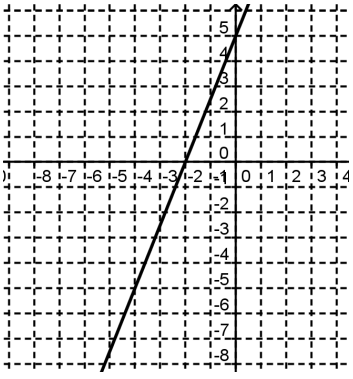
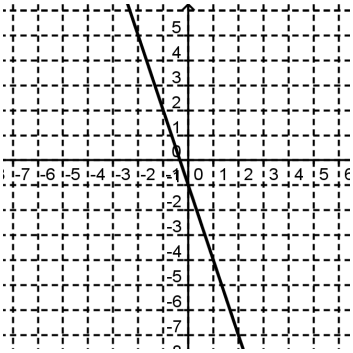


25.



26. At least two.
27. Three would be safer because it would point out any errors.
28.



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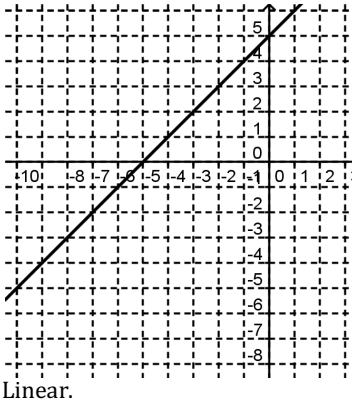
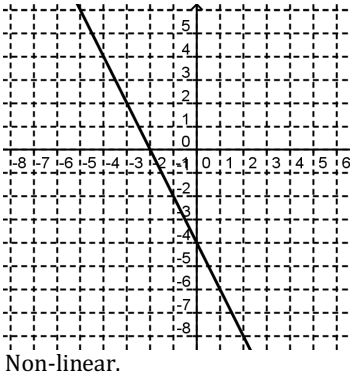
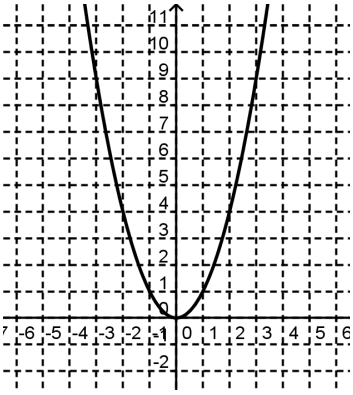


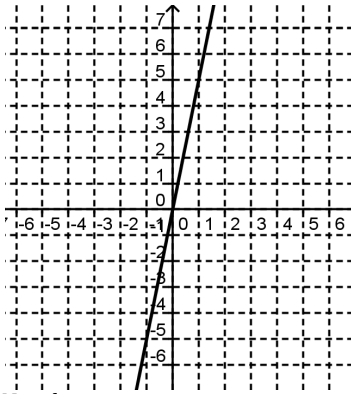
30. Linear.



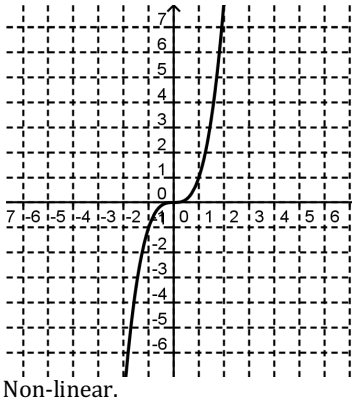
31. Non-linear.



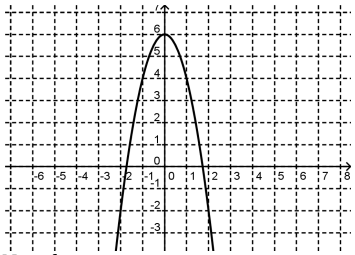
32. Linear.



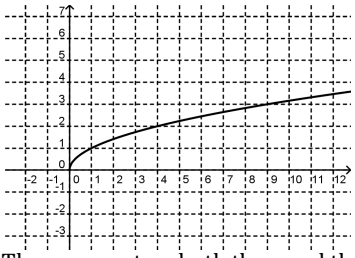
33. Non-linear.



34. Non-linear.

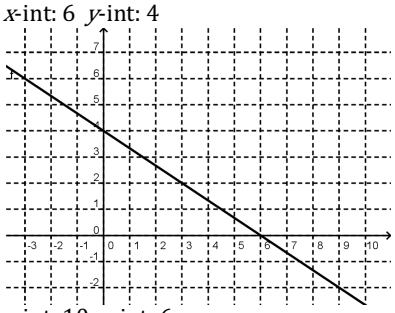


35. Non-linear.

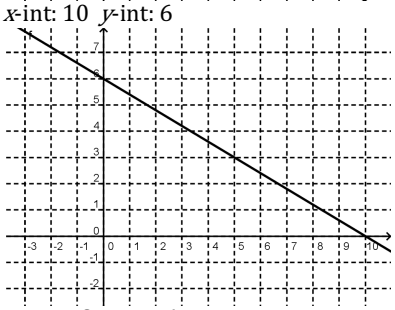


36. The exponent on both the x and the y must be 1.
37. (0,4)
38. 0
39. (8,0)
40. 0

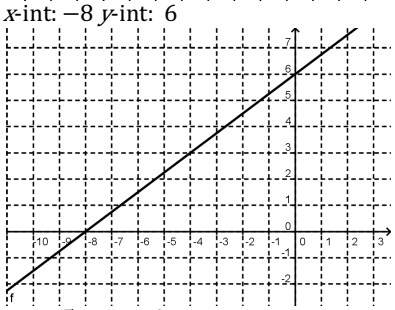
41. x-int: 6 y-int: 4



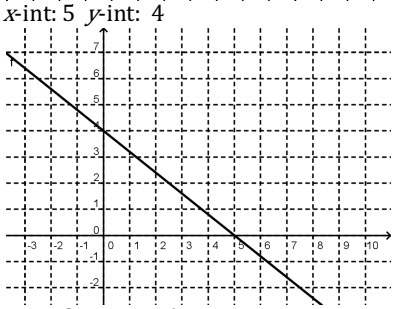
42. x-int: 10 y-int: 6



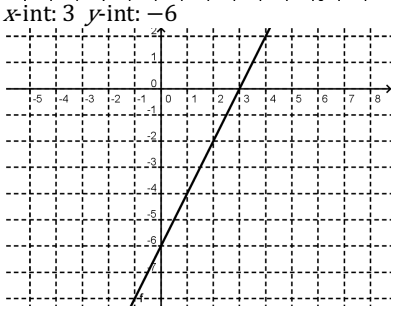
43. x-int: -8 y-int: 6



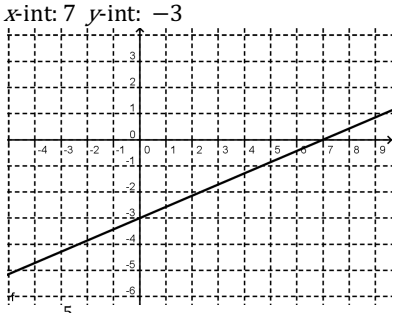
44. x-int: 5 y-int: 4



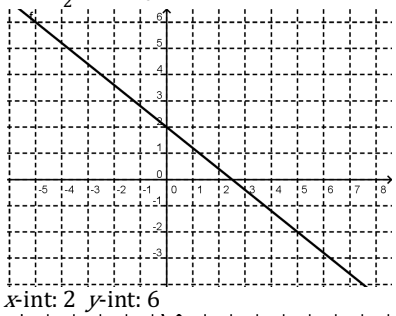
45. x-int: 3 y-int: -6



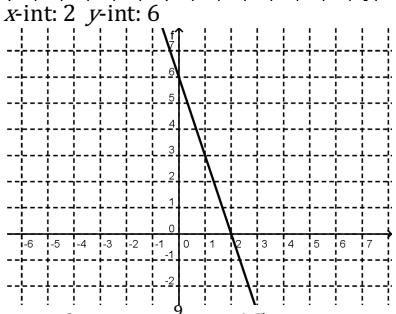
46. x-int: 7 y-int: -3



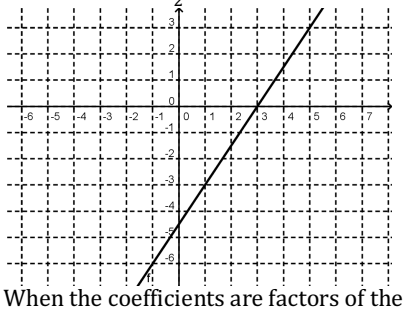
47. x-int: $\frac{5}{2}$ or 2.5 y-int: 2



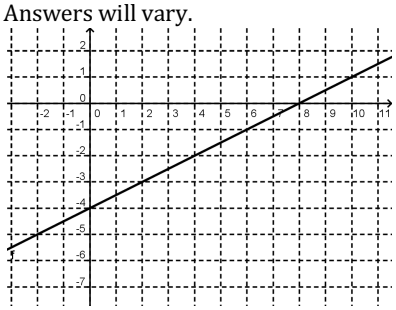
48. x-int: 2 y-int: 6



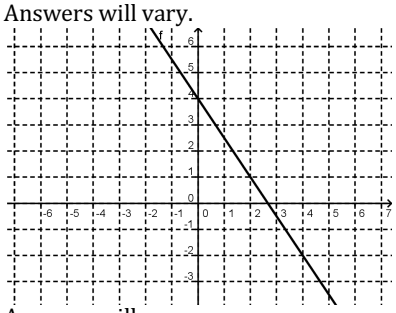
49. x-int: 3 y-int: $-\frac{9}{2}$ or -4.5



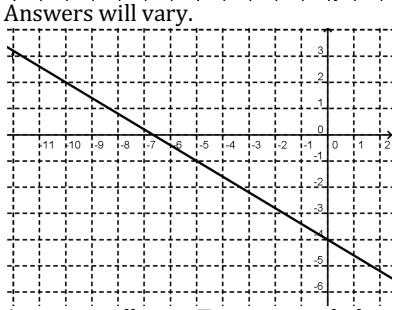
50. When the coefficients are factors of the constant term. This will produce intercepts that can be graphed easily.
51. Answers will vary.



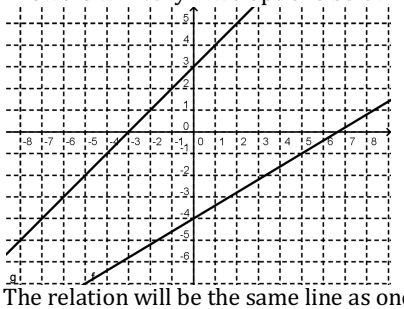
52. Answers will vary.



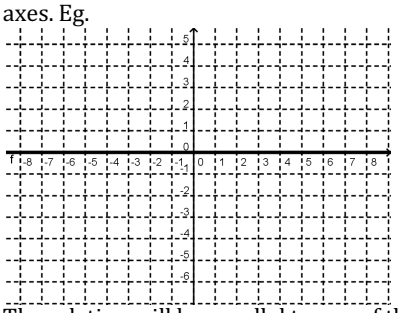
53. Answers will vary.



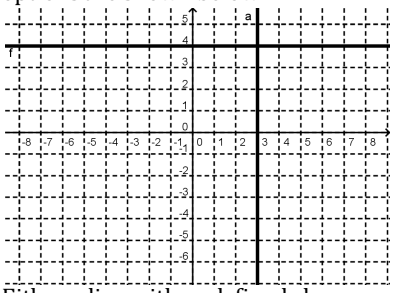
54. Answers will vary. Two options below.



55. The relation will be the same line as one of the axes. Eg.

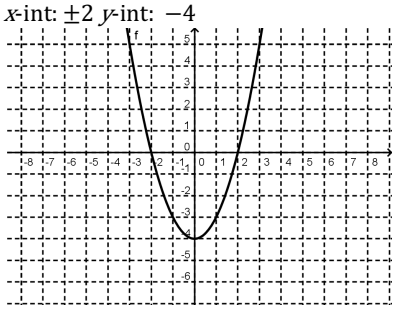


56. The relation will be parallel to one of the axis. Two options are shown below.

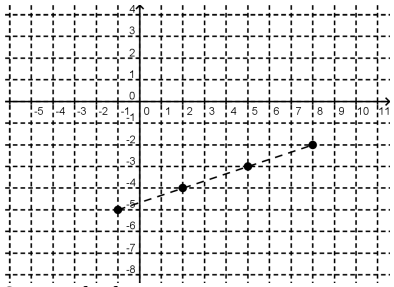


57. Either a line with undefined slope or zero slope.
58. x-int: 2 y-int: 3

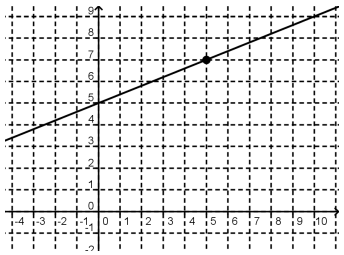
59. x-int: ± 2 y-int: -4



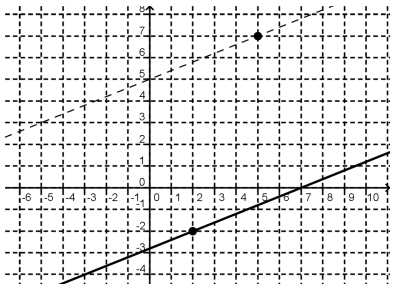
60.



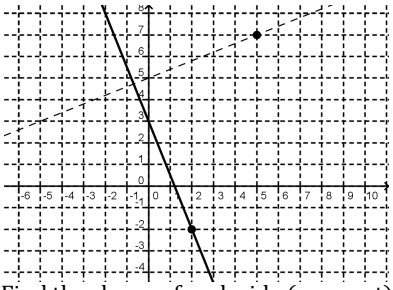
61. On graph above.
62. Slope of all three sections is $\frac{1}{3}$.
63. Different sections of the same line or line segmet will have equal slopes.
64. $m = 3$
65. $m = -\frac{2}{5}$
66. $m = 3$
67. $m = \frac{1}{3}$
68. $m = \frac{1}{2}$
69. $m = -2$
70.



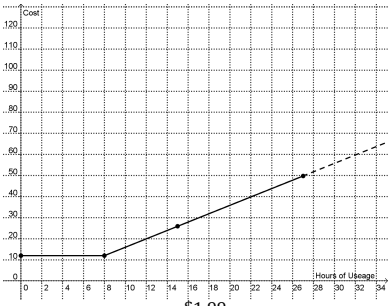
71.



72.

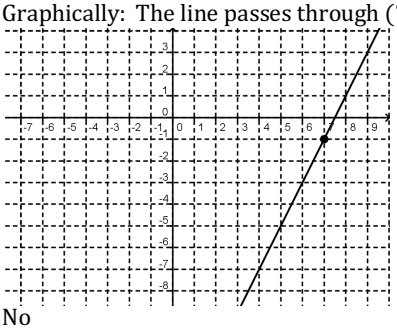


73. Find the slopes of each side (segment) and determine if any pair of segments had perpendicular slopes (negative reciprocals).
74. Many answers. Eg. $(1,-4),(3,-1),(7,5),(9,8)$
75. Many answers. Eg. $(-3,7),(1,-3),(3,-8)$
76.

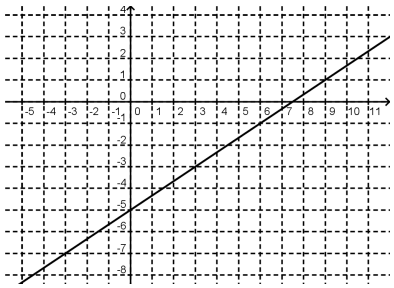
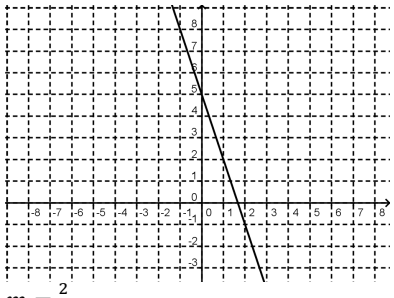
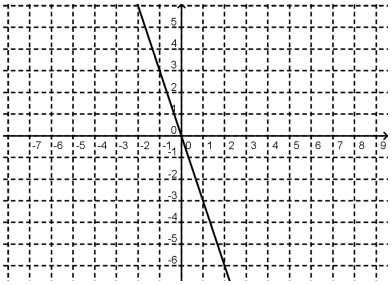
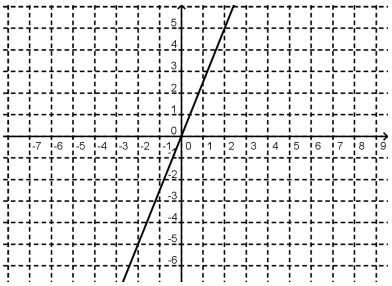
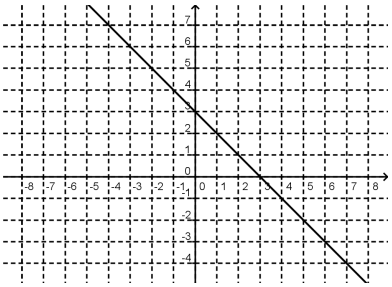
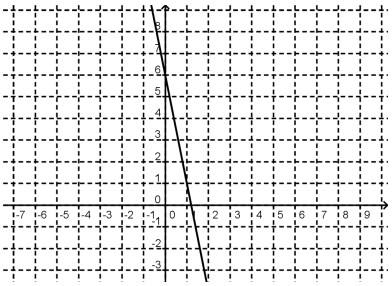
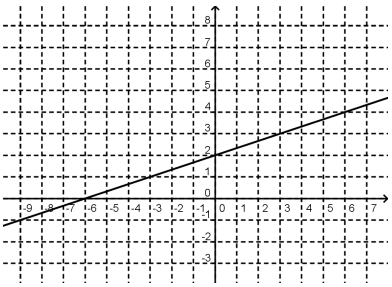


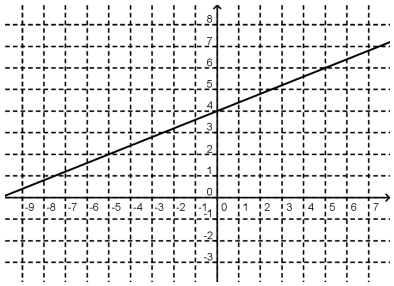
77. Rate = Slope. $r = \frac{\$1.99}{hr}$ or \$1.99 per hour.
78. Slope (cost per hour)
79. \$11.95
80. $m = \frac{5}{4}$
81. $m = 0$
82. $m = -\frac{2}{3}$
83. 6
84. 2
85. Algebraically:
$-1 = 2(7) - 15$
$-1 = 14 - 15$
$-1 = -1$
Left side equals right side, therefore $(7,-1)$ satisfies the equation and is on the line.

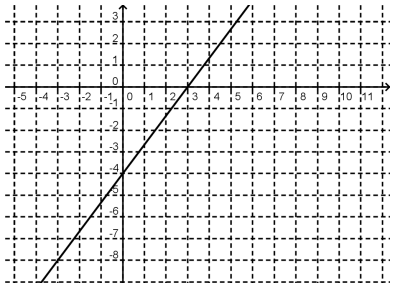
Graphically: The line passes through $(7,-1)$

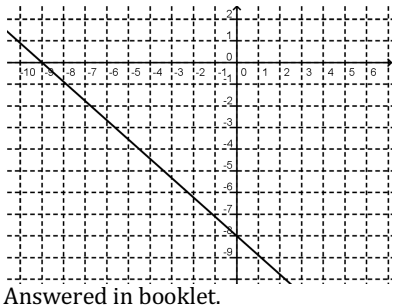


86. No
87. Yes
88. Yes
89. Yes
90. No

91. Yes
92. Answered in booklet.
93. No. It does not satisfy the equation.
94. No. It does not satisfy the equation.
95. Yes. As the x-values increase by 1, the y-values also increase by 1. Constant rate of change (slope) means the relation is linear.
96. Yes. These points form a vertical line. (This is a linear relation but not a function.)
97. Yes. As the x-values increase by 1, the y-values decrease by 1. Constant rate of change (slope) means the relation is linear.
98. 
99. 
100. $m = \frac{2}{3}$
101. $m = -3$
102. -5
103. 5
104. The slope is the coefficent on the x and the y-intercept is the constant term.
105. The slope is the coefficent on the x and the y-intercept is the constant term.
106. $m = -3,\ \ b = 2$
107. $m = -\frac{3}{5},\ \ b = -7$
108. $m = \frac{9}{2},\ \ b = -\frac{3}{2}$
109. $y = 2x - 5$
110. $y = \frac{7}{3}x + \frac{2}{3}$
111. $y = -3x - 2$
112. $m = \frac{3}{4},\ \ b = 3$, equation: $y = \frac{3}{4}x + 3$
113. $m = -1,\ \ b = -2$, equation: $y = -x - 2$
114. $m = -4,\ \ b = 0$, equation: $y = -4x$
115. $m = -\frac{1}{3},\ \ b = -3$, equation: $y = -\frac{1}{3}x - 3$
116. $m = \frac{3}{2},\ \ b = -4$, equation: $y = \frac{3}{2}x - 4$
117. $m = 3,\ \ b = 0$, equation: $y = 3x$
118. The equation will not have a constant term, it is zero.
119. If the y-intercept is positive, the value of b will be positive.
120. If the y-intercept is negative, the value of b will be negative.
121. 
122. 
123. 
124. 
125. 

126.


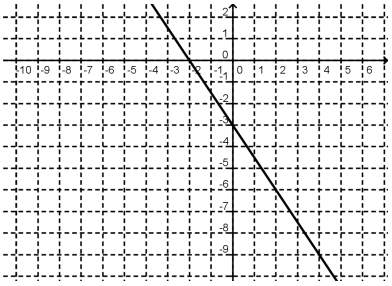
127.


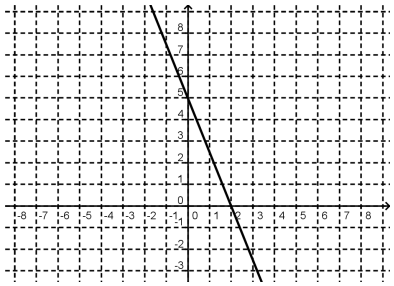
128.


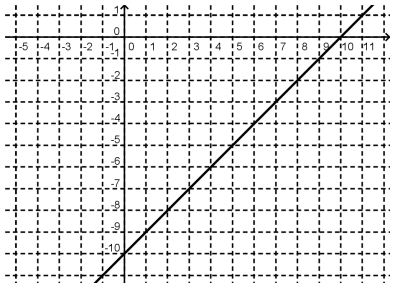
129. Answered in booklet.
130. $y = 3x + 7$
131. $y = 3x - 11$
132. $y = 3x - 5$
133. $y = 3x + \frac{13}{2}$
134. $y = 3x - 1$
135. $y = \frac{1}{4}x + 2$
136. $y = -5x + 2$
137. $y = \frac{1}{5}x + 2$

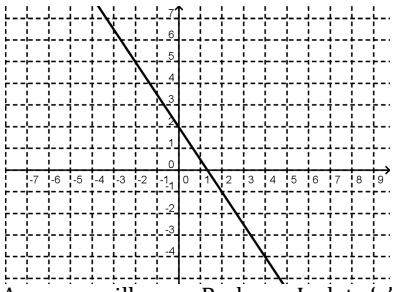
What you just did above is one way that you will be able to find the equation of a line. **IF** you have the ***slope*** or the ***y-intercept,*** you can input the ***coordinates*** of a point on the line to solve for the unknown part of the equation.

Then you will write the full equation with ***slope*** and ***y-intercept*** in place of *m* and *b*.

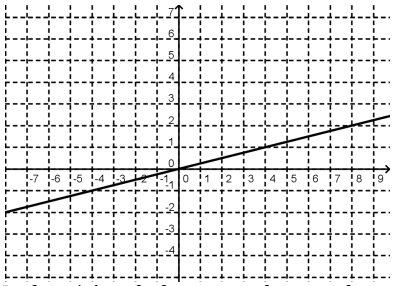
138. $3x - y - 5 = 0$
139. $x - y + 12 = 0$
140. $2x - 4y - 3 = 0$
141. $x + 12y + 6 = 0$
142. $2x - 3y + 36 = 0$
143. $9x + 8y - 60 = 0$
144. $y = 3x - 1$ or $3x - y - 1 = 0$
145. Answered in booklet.
146. a) $y - 2 = 2(x + 5)$
    b) $y = 2x + 12$
    c) $2x - y + 12 = 0$
147. a) $y + 1 = -2(x + 5)$
    b) $y = -2x - 11$
    c) $2x + y + 11 = 0$
148. a) $y - 4 = -\frac{1}{3}(x + 3)$
    b) $y = -\frac{1}{3}x + 3$
    c) $x + 3y - 9 = 0$
149. a) $y - 4 = \frac{1}{2}(x - 2)$
    b) $y = \frac{1}{2}x + 3$
    c) $x - 2y + 6 = 0$
150. a) $y - 7 = -(x - 0)$
    b) $y = -x + 7$
    c) $x + y - 7 = 0$
151. Answered on page.
152. a) $y - 6 = 5(x - 4)$
    b) $y = 5x - 14$
    c) $5x - y - 14 = 0$
153. a) $y + 1 = \frac{1}{2}(x + 2)$
    b) $y = \frac{1}{2}x$
    c) $x - 2y = 0$
154. a) $y + 6 = -\frac{3}{4}(x - 5)$
    b) $y = -\frac{3}{4}x - \frac{9}{4}$
    c) $3x + 4y + 9 = 0$
155. a) $y - 6 = \frac{4}{3}\left(x - \frac{1}{2}\right)$
    b) $y = \frac{4}{3}x + \frac{16}{3}$
    c) $4x - 3y + 16 = 0$
156. a) $y - 1 = \frac{3}{2}(x + 2)$
    b) $y = \frac{3}{2}x + 4$
    c) $3x - 2y + 8 = 0$
157. $2x - y - 2 = 0$
158. $y = 2x - 2,\ \ 2x - y - 2 = 0$
159. $y = 5x + 6,\ \ 5x - y + 6 = 0$
160. $x - 2y - 11 = 0$
161. $x - 2y - 3 = 0$
162. $4x + 5y - 20 = 0$
163. $y + 7 = 0$
164. $3x + 12y - 5 = 0$
165. $30x - 20y - 1 = 0$
166.


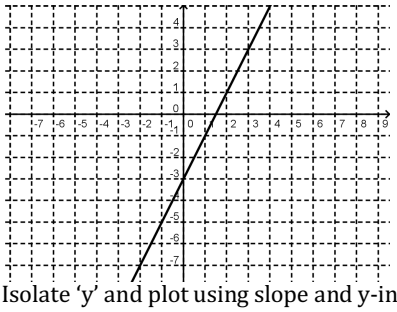
167. 

168. 

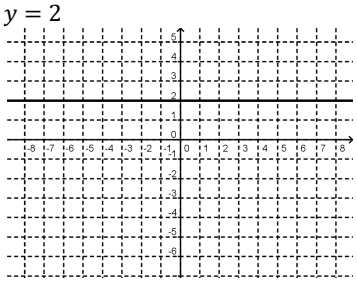
169. 

170. Answers will vary. Perhaps: Isolate 'y' and plot using slope and y-intercept.

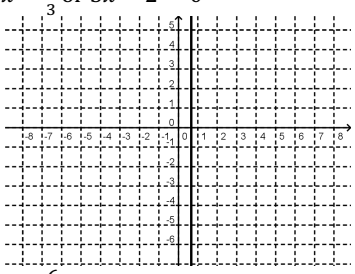
171. 
Isolate 'y' and plot using slope and y-intercept.

172. 
Isolate 'y' and plot using slope and y-intercept.

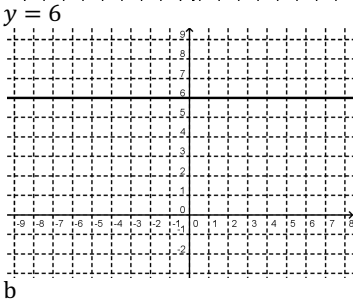
173. C
174. D
175. C
176. a
177. b
178. b
179. Each element in the range is two less than three times the corresponding element in the domain.
180. Adding an element in the domain to twice its element in the range gives a sum of 4.
181. Each element in the range is four less than three-fifths the corresponding element in the domain.
182. a, b, c
183. e, g
184. i, j
185. $m = \frac{2}{3}, b = 3,$
$y = \frac{2}{3}x + 3, 2x - 3y + 9 = 0$
186. $m = -\frac{5}{3}, b = 4,$
$y = -\frac{5}{3}x + 4,\ 5x + 3y - 12 = 0$
187. $m = -\frac{2}{3}, b = 2,$
$y = -\frac{2}{3}x + 2,\ 2x + 3y - 6 = 0$
188. $m = 0, b = -6,$
$y = -6,\ y + 6 = 0$
189. a) 3 b) $-\frac{1}{3}$
190. a) $-\frac{2}{3}$ b) $\frac{3}{2}$
191. a) $\frac{5}{3}$ b) $-\frac{3}{5}$
192. Answered on page.
193. $y = \frac{2}{3}x + \frac{11}{3}$ or $2x - 3y + 11 = 0$
194. $y = \frac{3}{4}x + \frac{13}{4}$ or $3x - 4y + 13 = 0$
195. $y = -3x + 5$ or $3x + y - 5 = 0$
196. $y = -x + 3$ or $x + y - 3 = 0$
197. $2x - 3y + 4 = 0$
198. $5x + y + 5 = 0$
199. $4x + y + 4 = 0$
200. $x + 3y + 3 = 0$
201. $y = 6$ *or* $y - 6 = 0$
202. $x = 8,$ *or* $x - 8 = 0$
203. $y = 8$ *or* $y - 8 = 0$
204. $x = -1$ *or* $x + 1 = 0$
205. $y = -3$ *or* $y + 3 = 0$
206. $x = -6$ *or* $x + 6 = 0$
207. $y = 2$



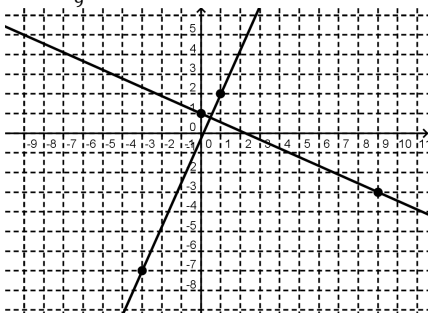
208. $x = \frac{2}{3}$ or $3x - 2 = 0$

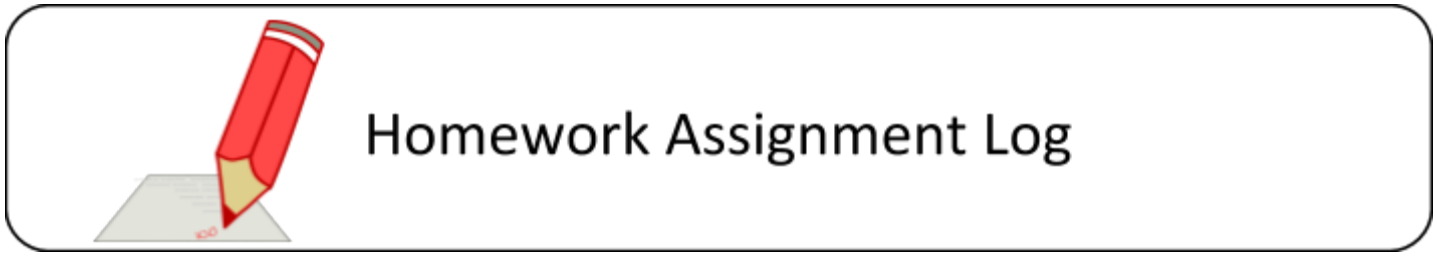


209. $y = 6$



210. b
211. c
212. They are vertical lines (undefined slope).
213. They are horizontal lines (zero slope).
214. $2x - 3y - 21 = 0$
215. $m = -2$
216. $2x + 3y - 1 = 0$
217. $k = 12$
218. $x - 5 = 0$
219. $x - 5y - 20 = 0$
220. $k = -4$
221. a, b, e
222. 21 m wide.
223. 101 cm.
224. $y = 50x + 400$
225. Answers will vary. The relationship has a constant rate and a initial fixed cost. This graph could represent the cost of renting a banquet hall with a fixed cost and an additional fee per person attending.
226. $C(n) = 75n + 1500$
227. $C(k) = 0.35k + 5.25$
228. $C(t) = 0.25t$
229. $C(k) = 0.25k + 40$
230. $C(s) = 5s$
231. $C(s) = 500$
232. $C(s) = 4s + 200$
233. $C(12) = 312$
234. $f(-3) = -\frac{9}{2}$
235. $h(20) = -3800$
236. $n = \frac{12}{25}$
237. $x = 30$
238. $t = \frac{4}{5}$
239. $C(4) = 40$
240. $x = 2$
241. $x = 5$
242. $x + 6y - 32 = 0$ or $y = -\frac{1}{6}x + \frac{16}{3}$
243. Yes, both lines have a slope of $-\frac{3}{2}$.
244. $y = -\frac{4}{9}x + 1$ or $4x + 9y - 9 = 0$





& Textbook Pages:_____

Date	Assignment/Worksheet	Due Date	Completed?

Quizzes & Tests:

What?	When?	Completed?
Quiz 1		
Quiz 2		
Unit/ Chapter test		