

This section will focus on graphing lines. Here are the forms of the most common equations that graph into lines. In this section we will focus on the general form and vertical and horizontal lines.

Summary

- General Form $Ax + By = C$
 A and B cannot both be 0.
- Slope – intercept form $y = mx + b$
The slope m , and the y -intercept is $(0, b)$.
- Point – slope form $y - y_1 = m(x - x_1)$
The slope is m , and the line passes through (x_1, y_1) .
- A horizontal line $y = b$
The slope is 0, and the y intercept is $(0, b)$.
- A vertical Line $x = a$
There is no defined slope, and the x -intercept is $(a, 0)$.

How to create a graph of a Linear Equation written in General Form: $Ax + By = C$ by plotting points.

- Every point on the line is a solution of the equation.
- Every solution of this equation is a point on this line.

Step 1. Pick 3 values to substitute into x in the given equation and solve for y . This will create 3 points to plot

Step 2. Plot the points in a rectangular coordinate system. Check that the points line up. If they do not, carefully check your work.

Step 3. Draw the line through the three points. Extend the line to fill the grid and put arrows on both ends of line.

For Example: Graph: $3x + 6y = 12$

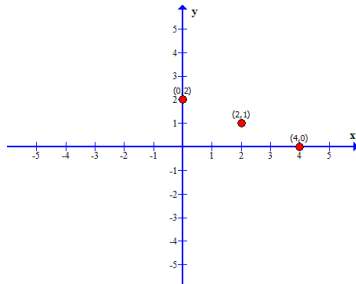
Step 1. Pick three values for x and solve for y . This is the step that can be tricky. You may pick any 3 values for x . If you choose wisely you will avoid fractions. If your choices are not carefully selected, you will have to deal with fractions. I will try to explain how I select the values to avoid fractions during class as it is quite a task to type my thought process.

I will choose: $x = 0, 2 \text{ and } 4$ (You literally can pick any 3 numbers for x . If you pick a number and the algebra gets messy, throw it out and try another value.)

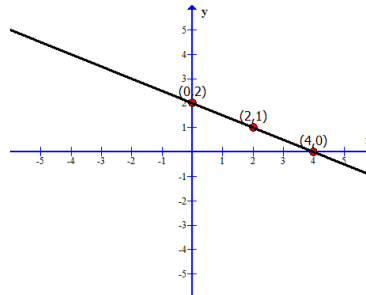
Step 1:

$x = 0$ $3(0) + 6y = 12$ $6y = 12$ $y = 2$ Point $(0, 2)$	$x = 2$ $3(2) + 6y = 12$ $6 + 6y = 12$ $6y = 6$ $y = 1$ Point $(2, 1)$	$x = 4$ $3(4) + 6y = 12$ $12 + 6y = 12$ $6y = 0$ $y = 0$ Point $(4, 0)$
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Step 2: Plot the 3 points



Step 3 connect the points with a line

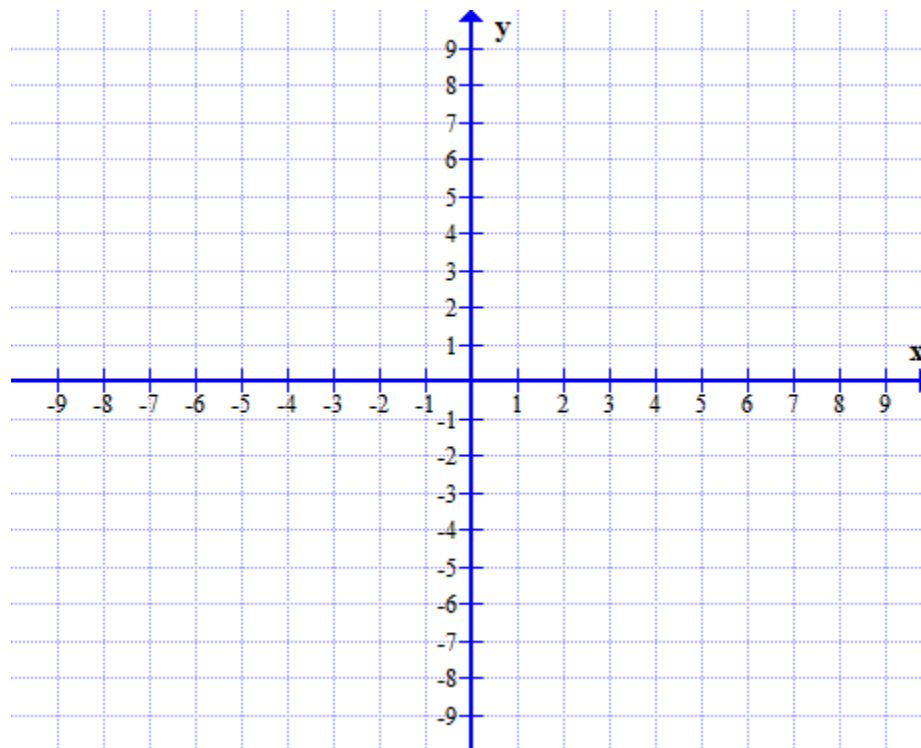


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

1) $x + y = 7$

2) $x + y = 5$

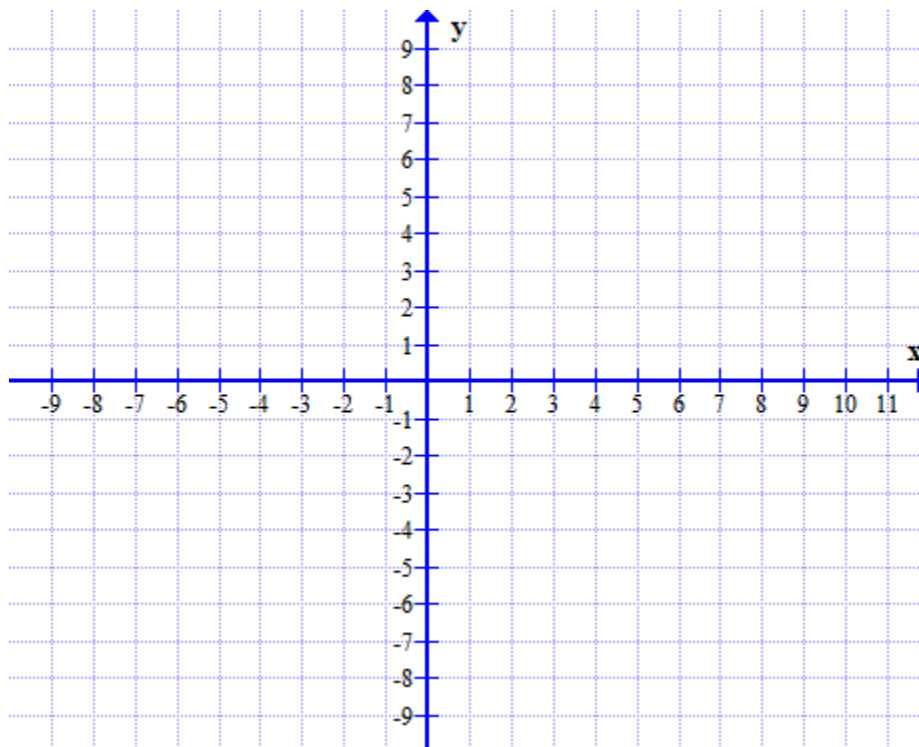


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

3) $x + 2y = 12$

4) $x + 5y = 10$

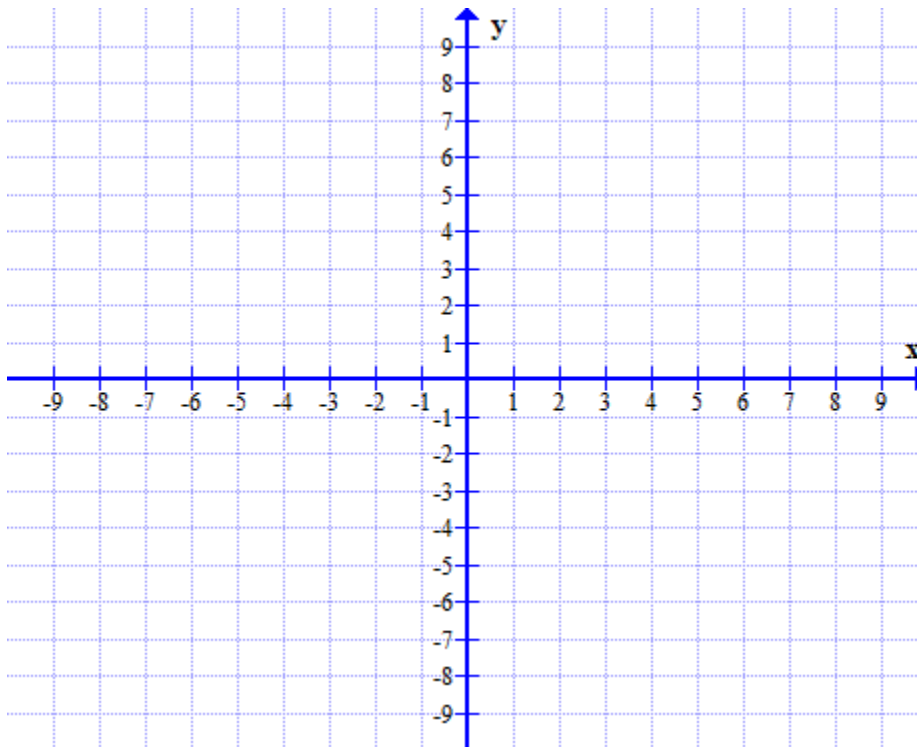


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

5) $3x - 2y = 6$

6) $2x - 3y = 12$

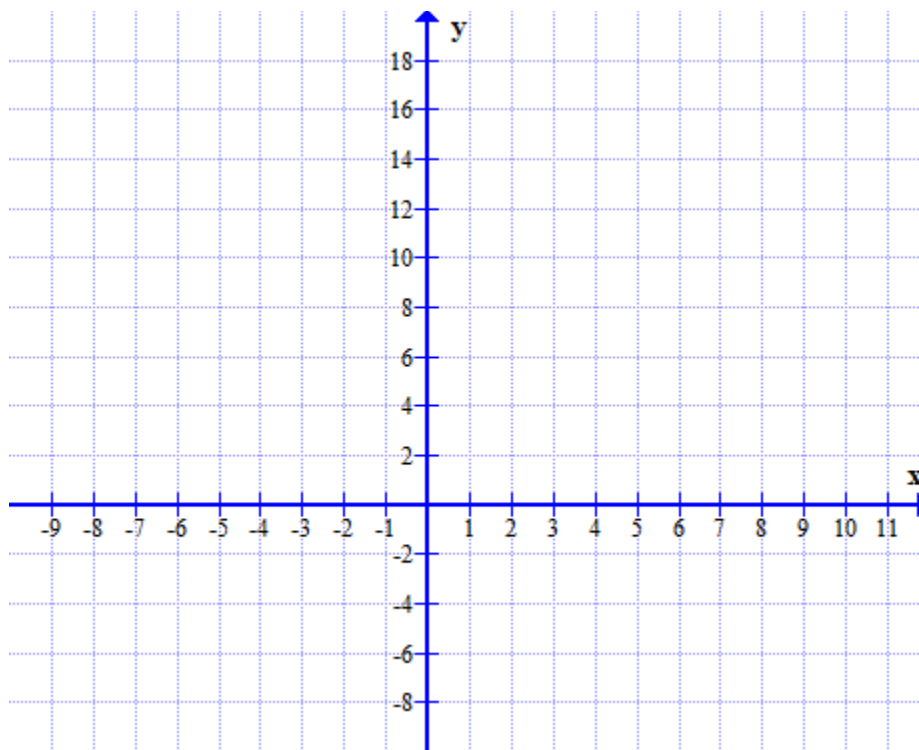


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

7) $4x + y = 24$

8) $2x + y = 16$

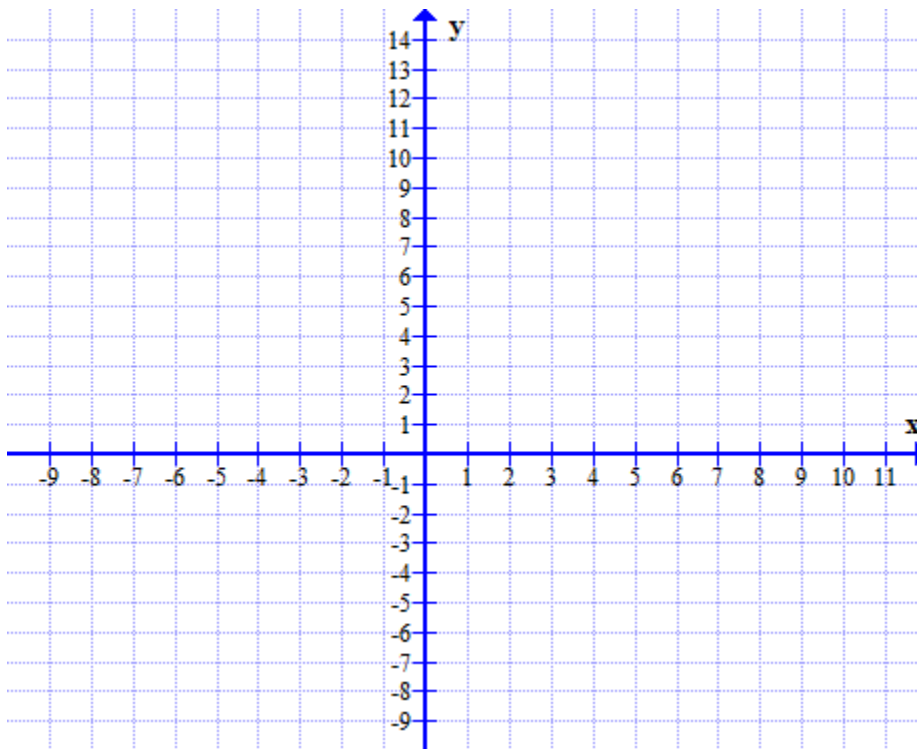


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

9) $y = 3x - 4$

10) $y = 5x - 3$

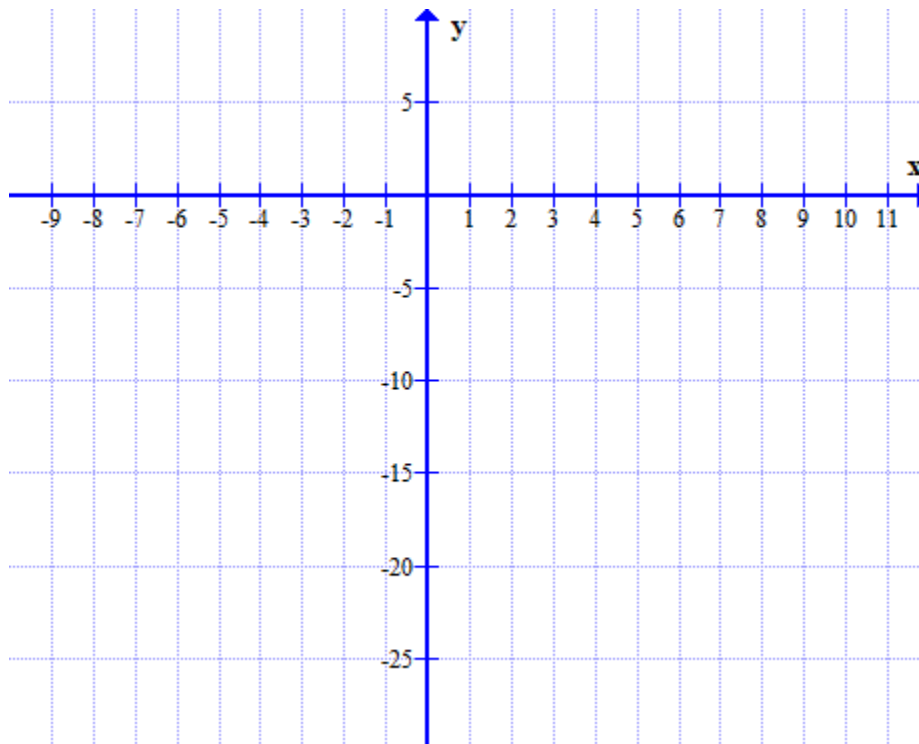


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

11) $y = -6x + 5$

12) $y = -8x + 1$

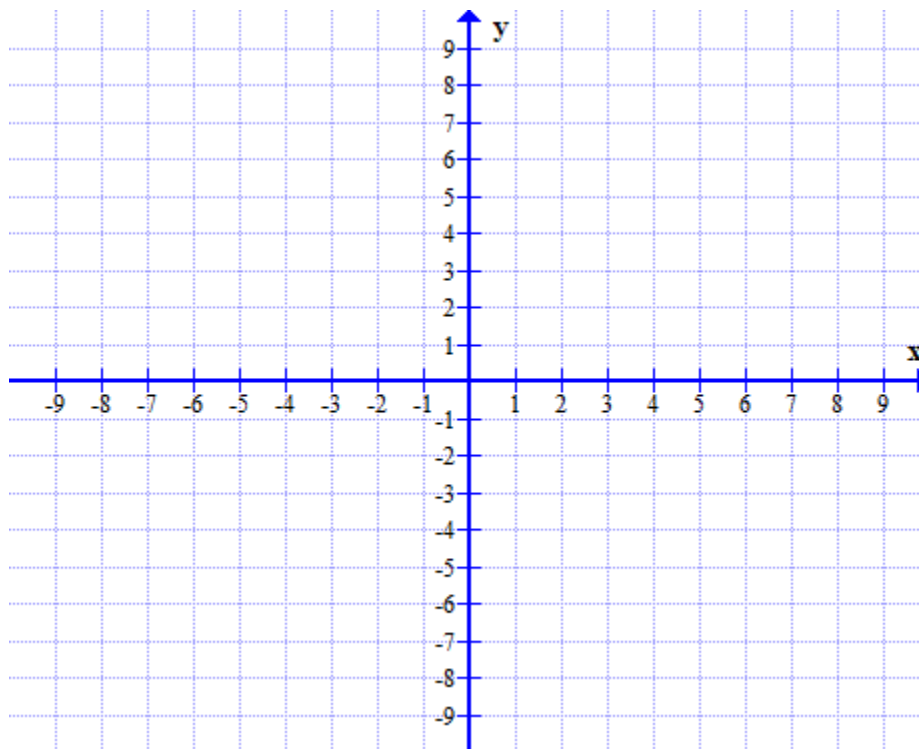


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

13) $y = \frac{1}{2}x - 2$

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

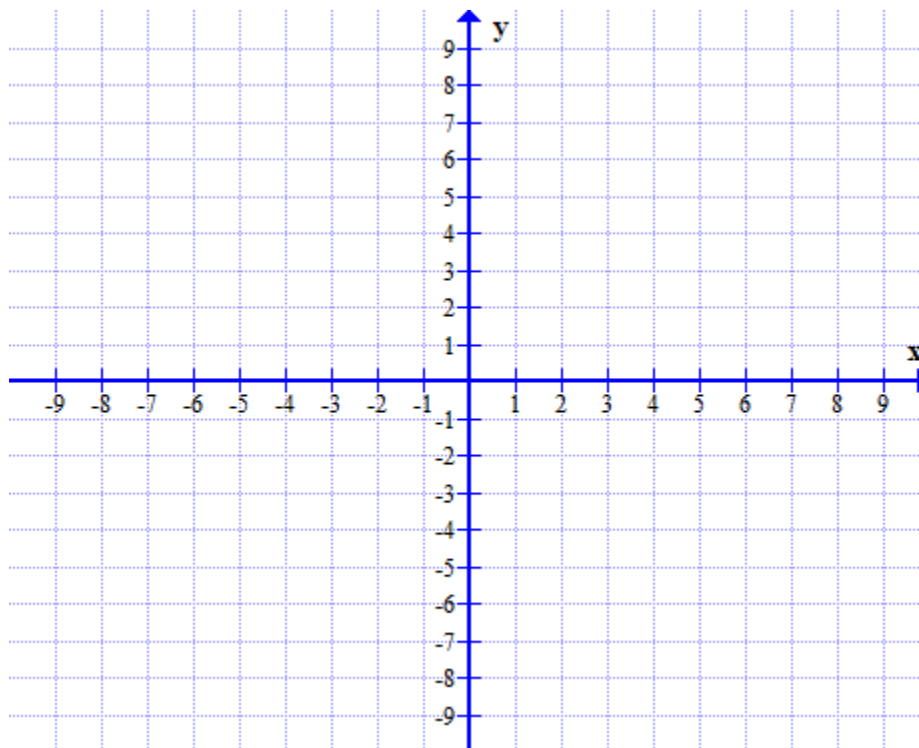


#1 – 15:

- a) Find three points
- b) plot the points
- c) Sketch a graph.

15) $y = -\frac{1}{3}x + 7$

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



x-intercept and y-intercept of a Line

- The x-intercept is the point $(a, 0)$ where the line crosses the x-axis. The x-intercept occurs when $y = 0$.
- The y-intercept is the point $(0, b)$ where the line crosses the y-axis. The y-intercept occurs when $x = 0$.

How to find the x – intercept and y – intercept from the equation of a line and then use them to sketch a graph of the line.

Step 1. Find the x - and y -intercepts of the line.

Let $y = 0$ and solve for x to find the x – *intercept*.

Let $x = 0$ and solve for y to find the y – *intercept*.

Step 2. Find a third solution to the equation by picking any number and plugging it in for x solve for y .

Step 3. Plot the three points and check that they line up.

Step 4. Draw the line

For Example: Find the x -intercept and y -intercept from the equation of a line and sketch a graph of the line. $2x - 4y = 8$

Step 1:

Find y – *intercept* by letting $x = 0$.

$$2(0) - 4y = 8$$

$$-4y = 8$$

$$y = -2$$

y – *intercept* $(0, -2)$

Find the x – *intercept* by letting $y = 0$.

$$2x - 4(0) = 8$$

$$2x = 8$$

$$x = 4$$

x – *intercept* $(4, 0)$

Step 2:

Pick a value for x and use it to find another point. I will pick $x = 2$.

$$2(2) - 4y = 8$$

$$4 - 4y = 8$$

$$-4y = 4$$

$$y = -1$$

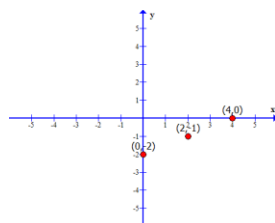
extra point $(2, -1)$

Section 3.1: Graph Linear Equations in Two Variables

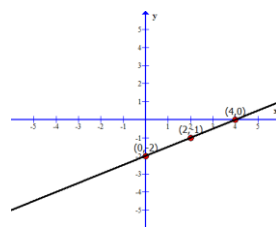
Chapter 3: Lines

Step 3: Plot the three points:

$(0, -2)$ $(4, 0)$ and $(2, -1)$



Step 4: Connect the points with a line.

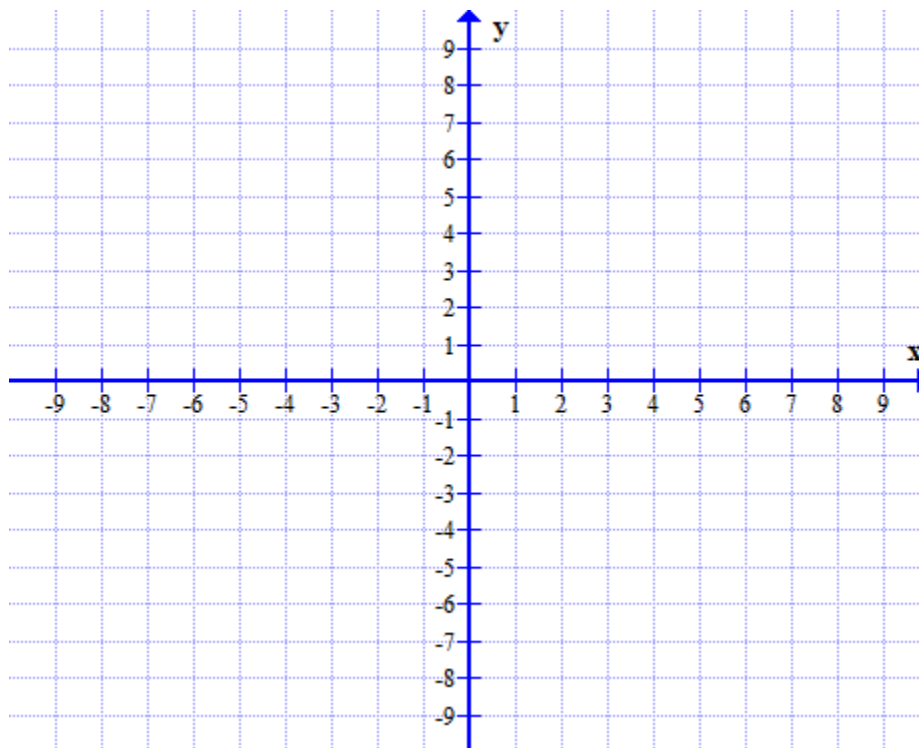


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

17) $x + 2y = 10$

18) $x + 3y = 9$

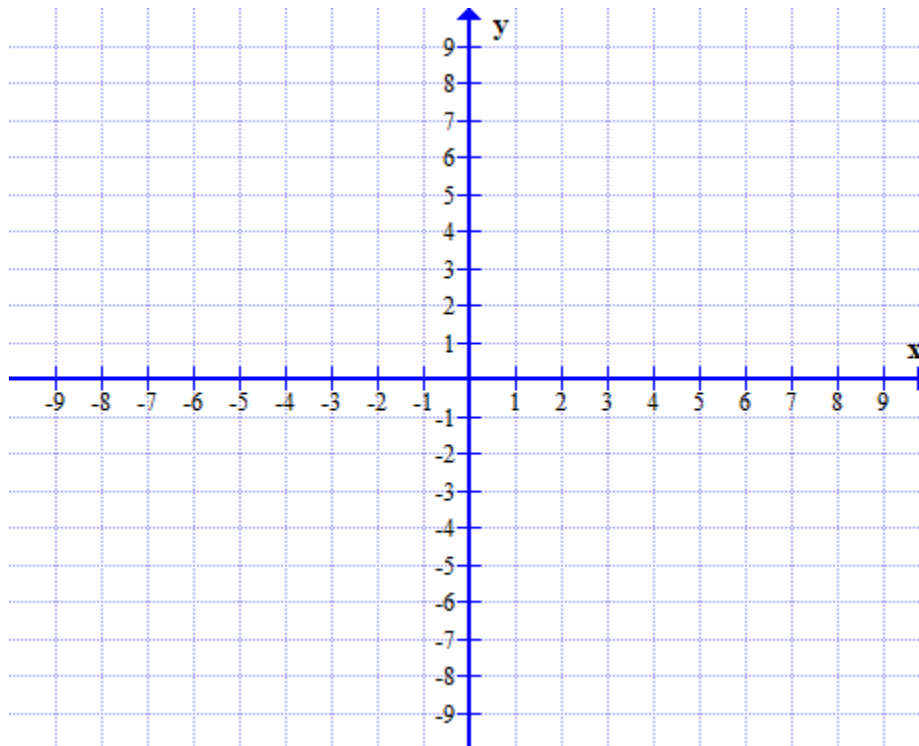


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

19) $3x - 2y = 24$

20) $4x - 5y = 20$

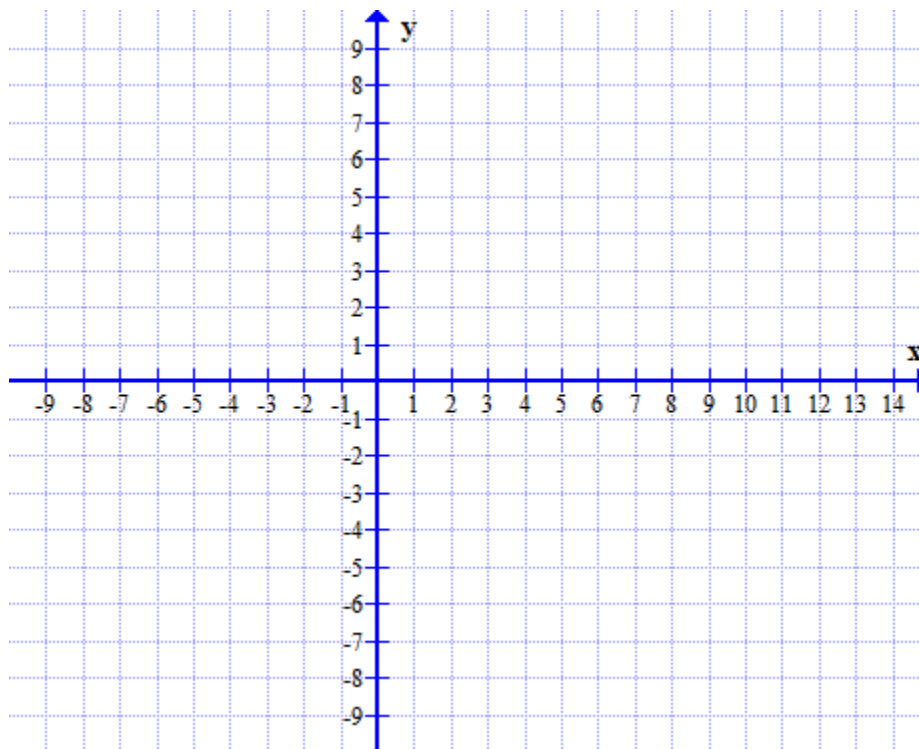


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

21) $2x + 3y = 24$

22) $4x + 6y = 48$

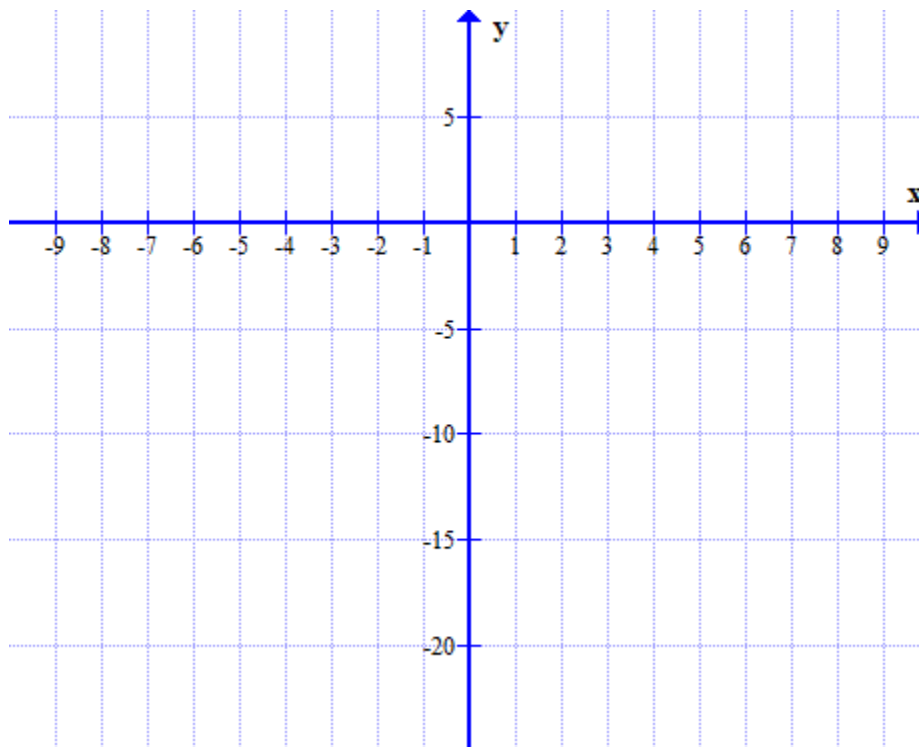


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

23) $y = 3x - 6$

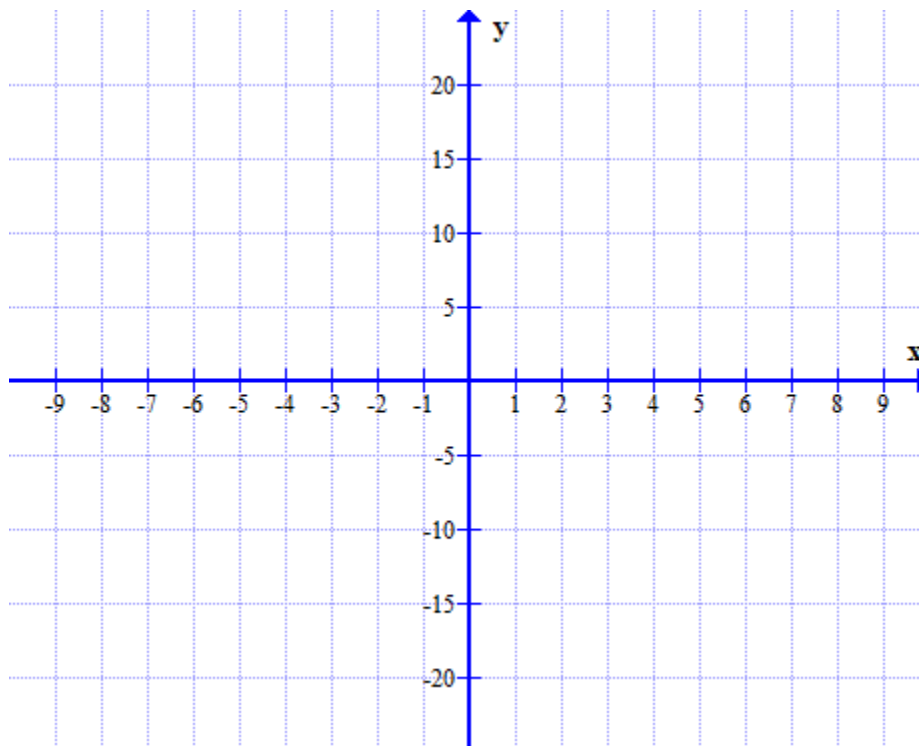
24) $y = 4x - 16$



#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

25) $y = 2x + 8$ 26) $y = 3x + 15$

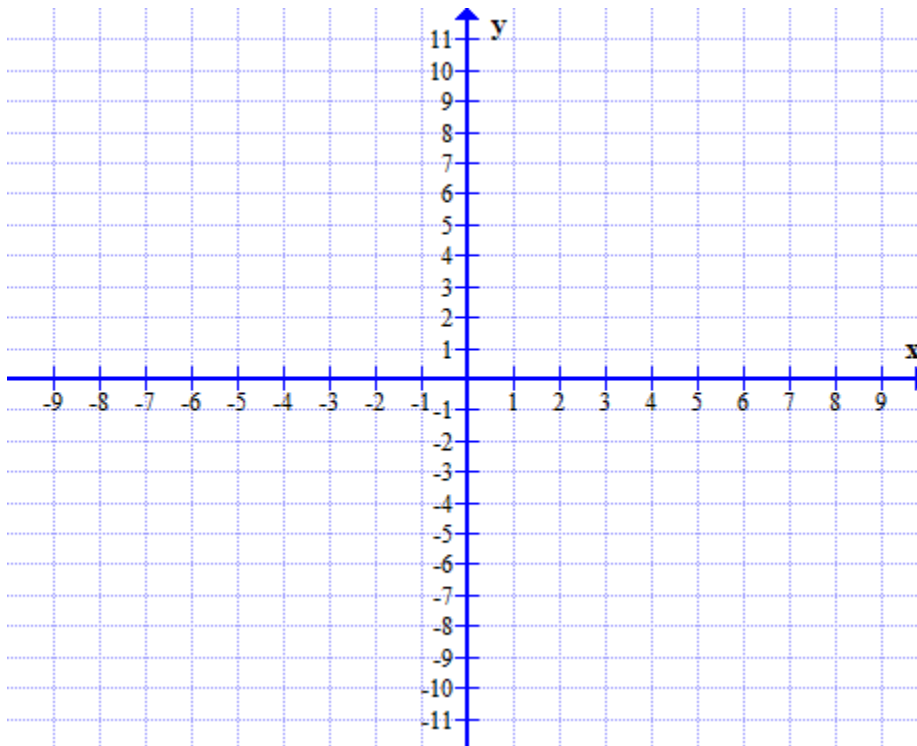


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

27) $y = \frac{1}{2}x - 4$

28) $y = \frac{1}{2}x - 10$

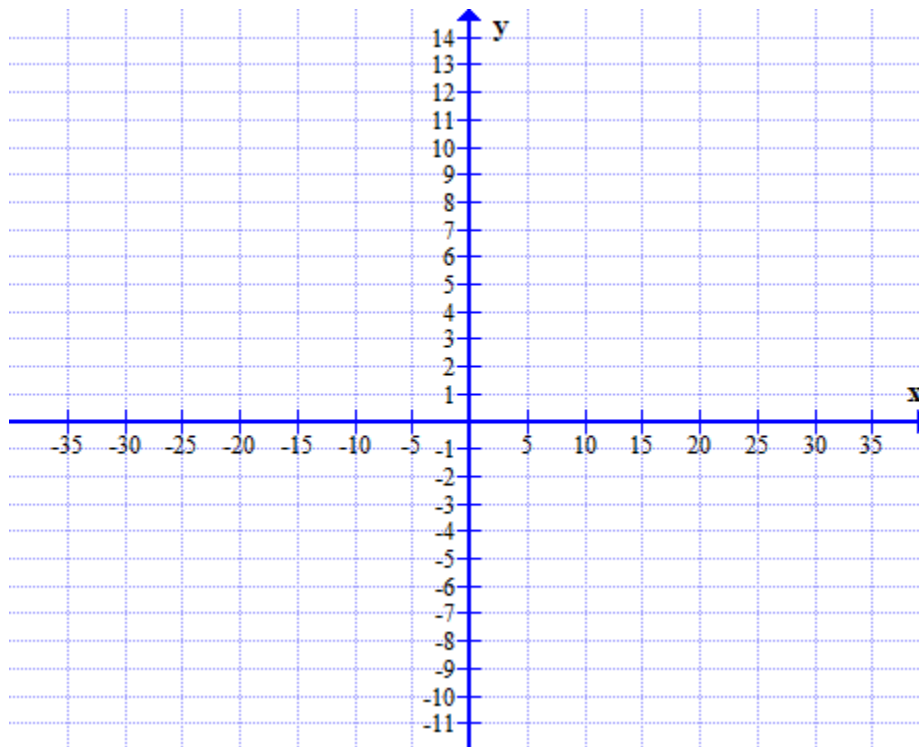


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

29) $y = -\frac{1}{3}x + 15$

30) $y = -\frac{1}{3}x + 12$

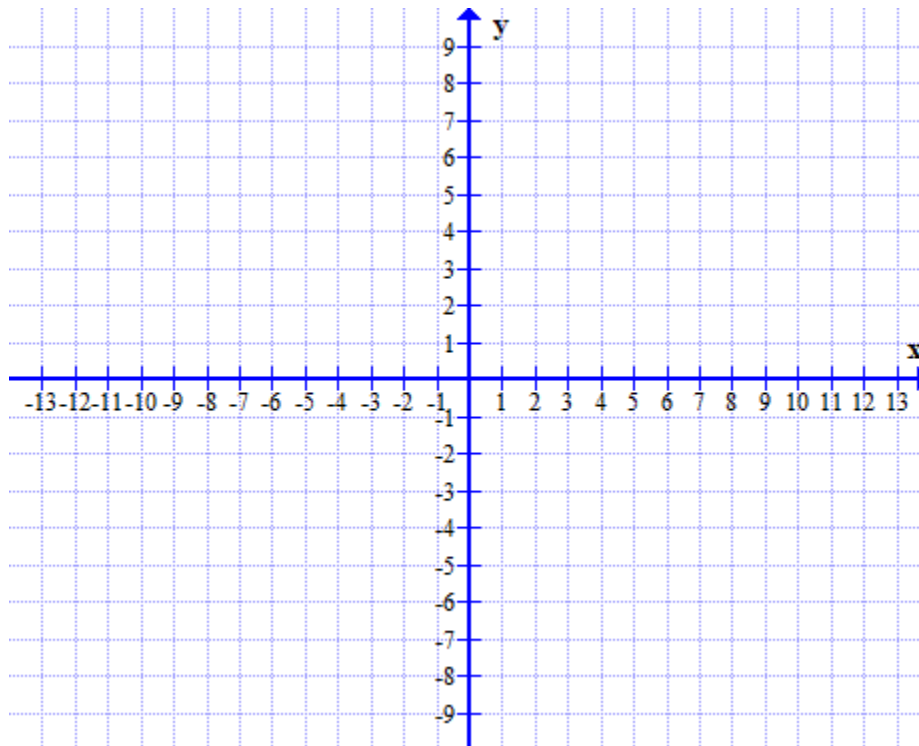


#17 - 32:

- a) Find the x-intercept
- b) Find the y-intercept
- c) Find an additional point
- d) Sketch a graph

31) $y = \frac{1}{2}x + 10$

32) $y = \frac{1}{2}x + 6$



Graphs of vertical lines in the form $x = a$

The graph of an equation of the form $x = a$ is a vertical line. The line passes through the x - $axis$ at $(a, 0)$.

Find three points and graph the vertical line $x = 4$.

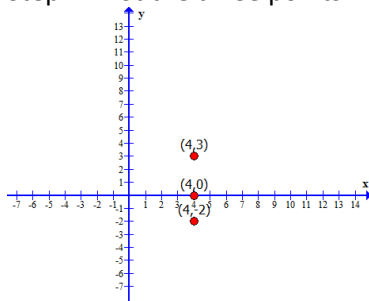
Step 1: Find three points.

Since the equation I am asked to graph has only 1 variable I am going to find my points using logic as opposed to using Algebra.

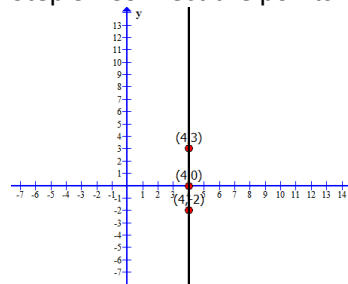
- The equation only has an x . Every point on the graph must meet the requirement that $x = 4$.
- The equation does not have a y . This implies that y can assume any numerical value.
- Any point of the form $(4, \#)$ will meet the only requirement: $x = 4$
- Create any points that have a 4 as the x -coordinate and they will be on the graph of $x = 4$.

The points I choose are $(4,0)$ $(4,-2)$ and $(4,3)$. Really, any three points that have 4 for x will work.

Step 2: Plot the three points



Step 3: Connect the points with a line.



Graphs of horizontal lines in the form $y = b$

The graph of an equation of the form $y = b$ is a horizontal line. The line passes through the y - axis at $(0, b)$.

Find three points and graph the vertical line $y = 6$.

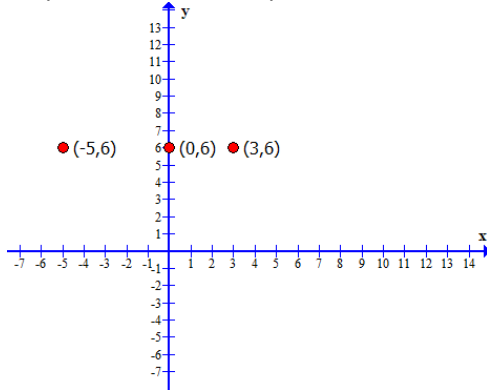
Step 1: Find three points.

Since the equation I am asked to graph has only 1 variable I am going to find my points using logic as opposed to using Algebra.

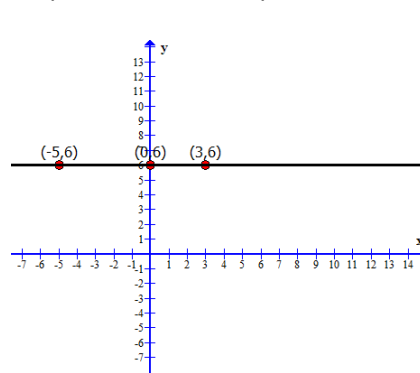
- The equation only has a y . Every point on the graph must meet the requirement that $y = 6$.
- The equation does not have a x . This implies that x can assume any numerical value.
- Any point of the form $(\#, 6)$ will meet the only requirement: $y = 6$
- Create any points that have a 6 as the y -coordinate and they will be on the graph of $y = 6$.

The points I choose are $(0,6)$ $(-5,6)$ and $(3,6)$. Really, any three points that have 6 for y will work.

Step 2: Plot the three points



Step 3: Connect the points with a line.



#33 – 42

a) Find three points

b) Plot the points

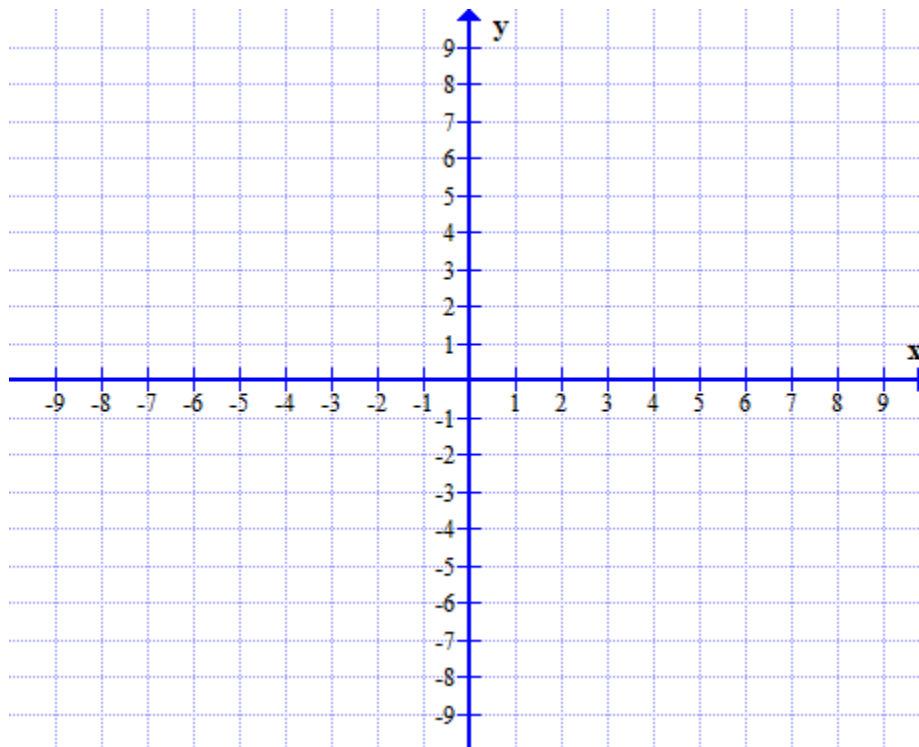
c) Sketch a graph.

d) Use the graph to find the x-intercept (say there is no x-intercept if the graph does not cross the x-axis).

e) Use the graph to find the y-intercept (say there is no y-intercept if the graph does not cross the y-axis.)

33) $x = 2$

34) $x = -3$



#33 – 42

a) Find three points

b) Plot the points

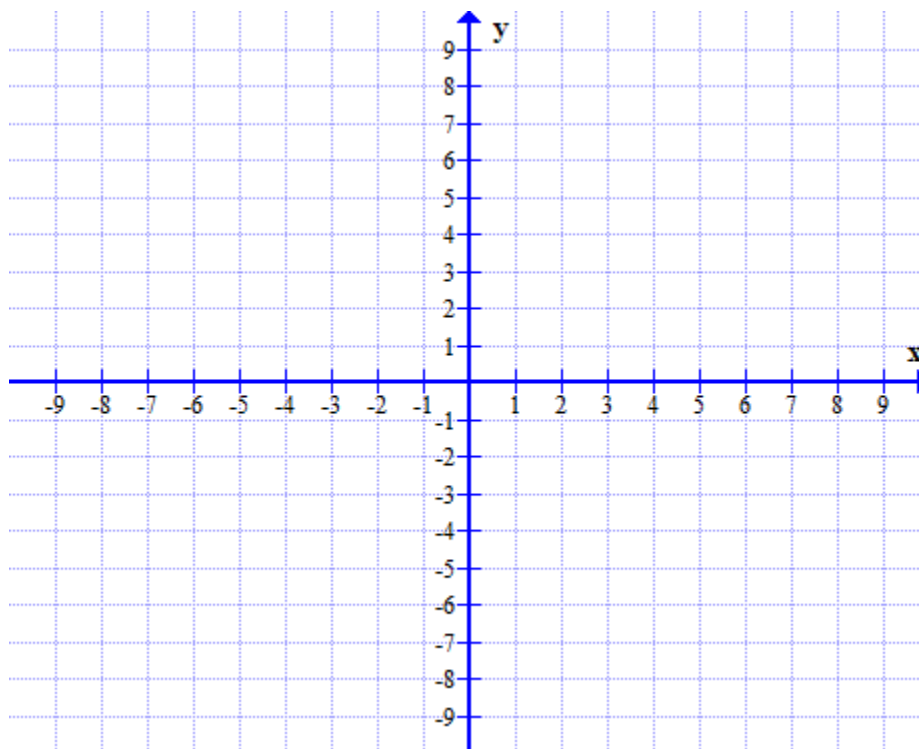
c) Sketch a graph.

d) Use the graph to find the x-intercept (say there is no x-intercept if the graph does not cross the x-axis).

e) Use the graph to find the y-intercept (say there is no y-intercept if the graph does not cross the y-axis.)

35) $y = 5$

36) $y = -2$



#33 – 42

a) Find three points

b) Plot the points

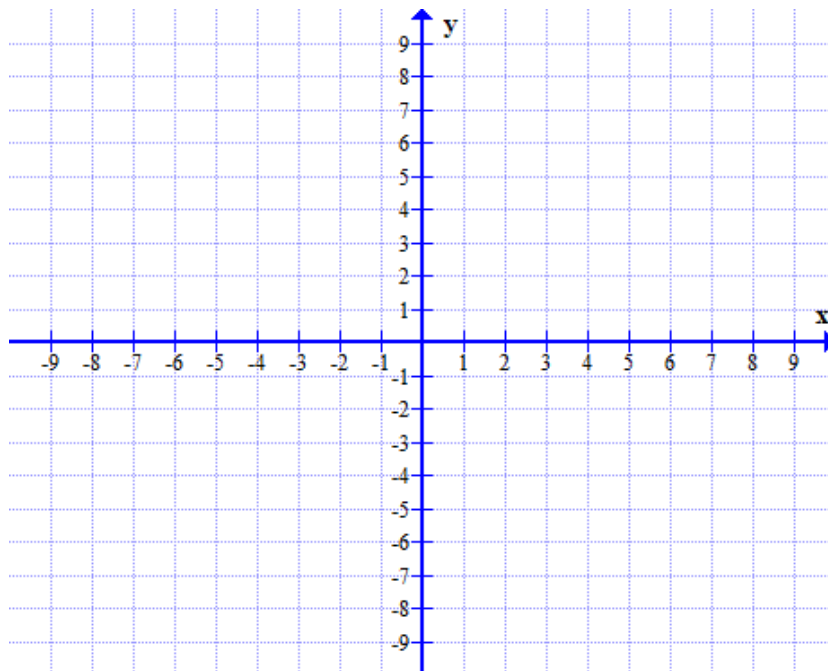
c) Sketch a graph.

d) Use the graph to find the x-intercept (say there is no x-intercept if the graph does not cross the x-axis).

e) Use the graph to find the y-intercept (say there is no y-intercept if the graph does not cross the y-axis.)

37) $x + 5 = 0$

38) $x - 4 = 0$



#33 – 42

a) Find three points

b) Plot the points

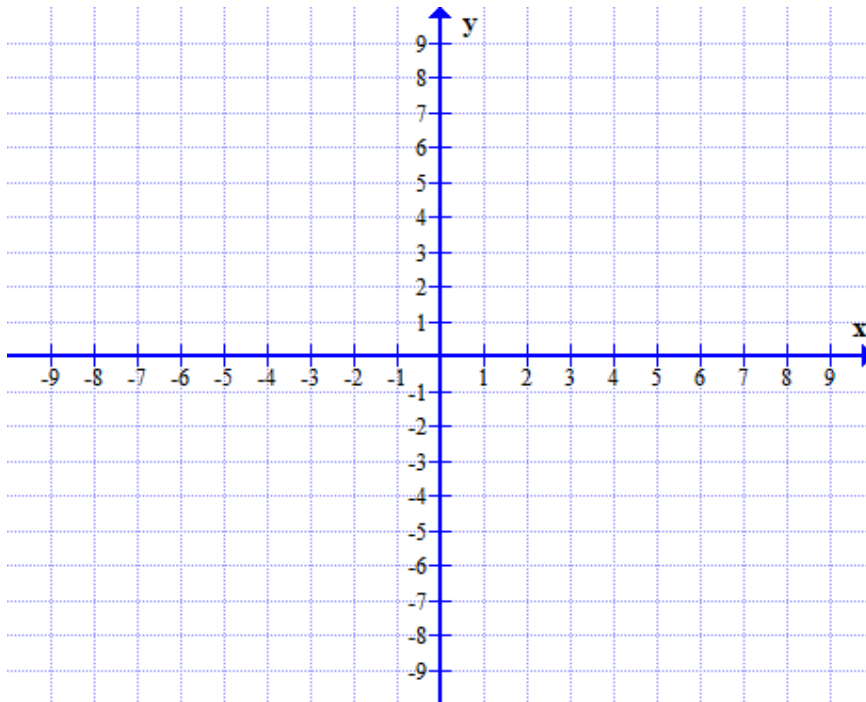
c) Sketch a graph.

d) Use the graph to find the x-intercept (say there is no x-intercept if the graph does not cross the x-axis).

e) Use the graph to find the y-intercept (say there is no y-intercept if the graph does not cross the y-axis.)

39) $y - 3 = 9$

40) $y + 2 = 8$



#33 – 42

a) Find three points

b) Plot the points

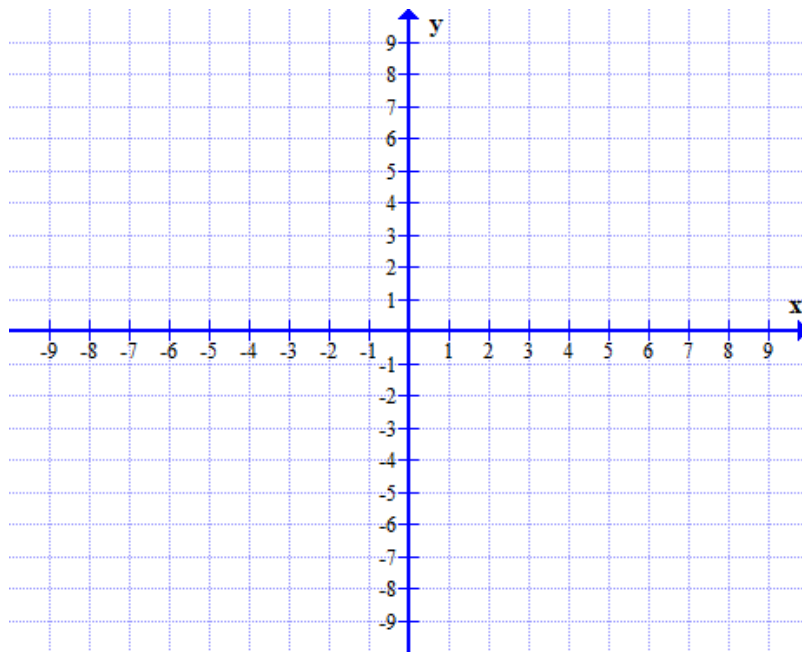
c) Sketch a graph.

d) Use the graph to find the x-intercept (say there is no x-intercept if the graph does not cross the x-axis).

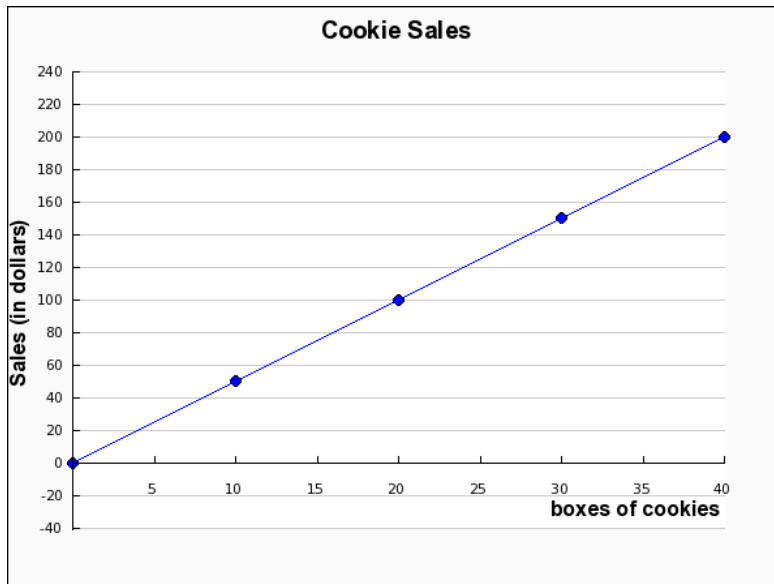
e) Use the graph to find the y-intercept (say there is no y-intercept if the graph does not cross the y-axis.)

41) $3x = 21$

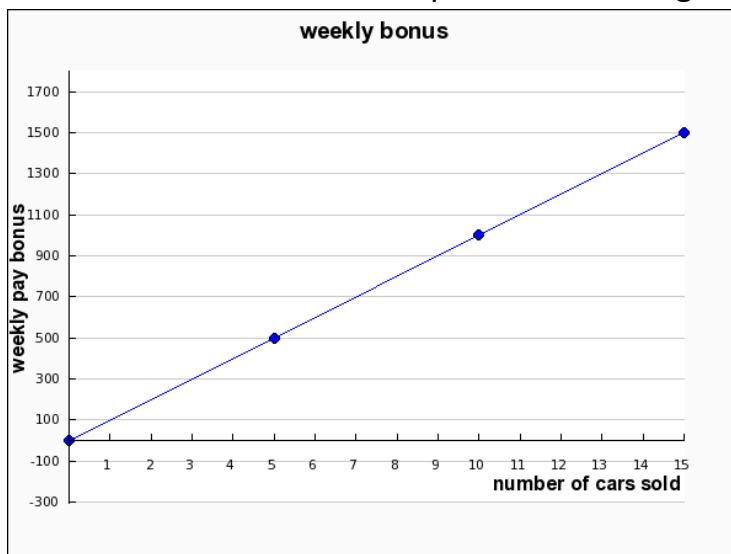
42) $5y = 45$



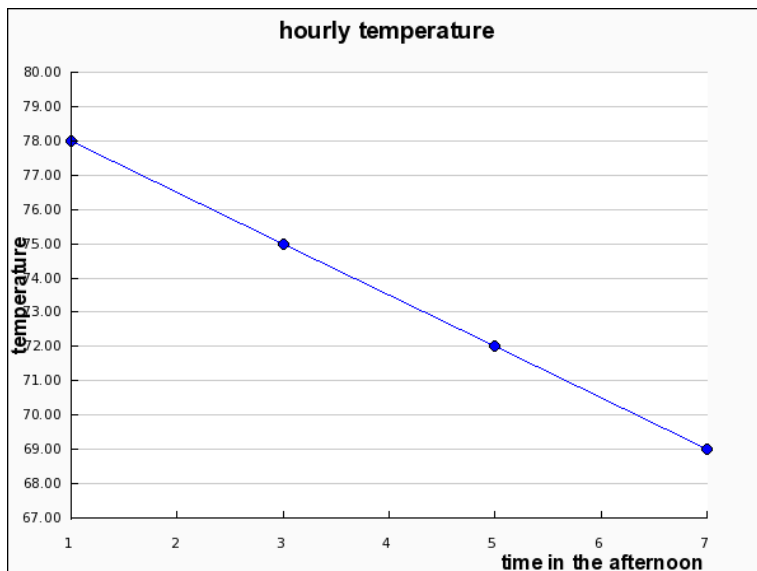
43) The following graph depicts the sale of boxes of girl scout cookies. Interpret the meaning of the point (20, 100)



44) The graph below shows the weekly bonus of salesman based on the number of cars sold in a week. Interpret the meaning of the point (10, 1000).



45) The graph below shows the hourly temperature at different times during the afternoon. Interpret the meaning of the point (5,72.00)



46) The graph below shows the number of miles left in a race relative to the number of hours since the start of the race. Interpret the meaning of the point (4,90).

