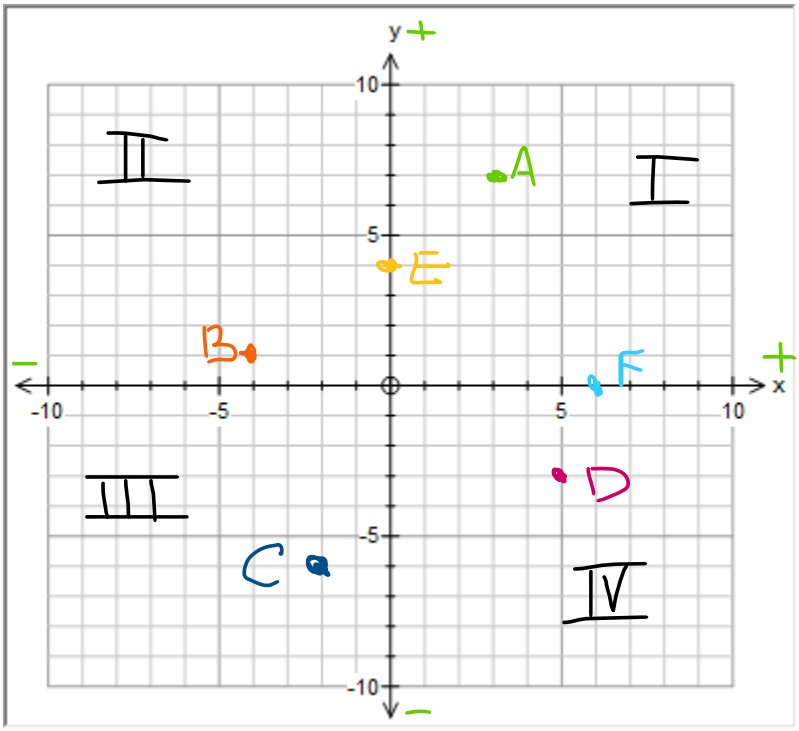
7/28/2023

Graphing points in a plane
Graphing Linear Equations



Center of the graph is referred to as the origin (0,0)
x-axis is the horizontal axis with positive to the right, and negative to the left
y-axis is the vertical axis with positive upward and negative downward

any point in the plane can be defined by a pair of coordinates (x,y). an ordered pair
The coordinate pair tells me how far to move in the x-direction (horizontally) and the how far to move in the y-direction (vertically)… starting from the origin.

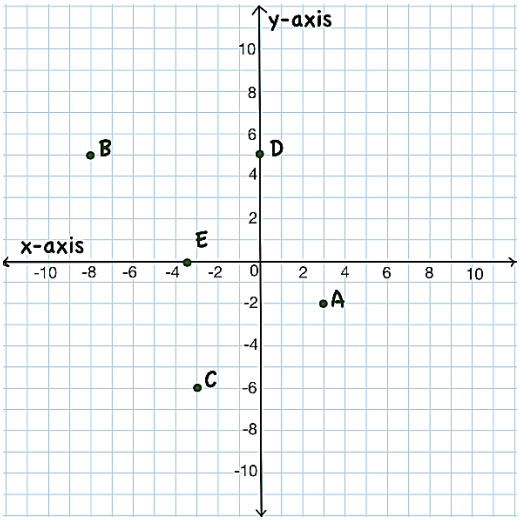
Point like (3,7)… move right from the origin three spaces, and then move upward 7 units. (Point A)
Point B (-4, 1)
Point C (-2,-6)
Point D (5, -3)
Point E (0,4)
Point F (6,0)

Any point with a 0 in the first coordinate (x=0), is a point on the y-axis.
Any point with a 0 in the second coordinate (y=0) is a point on the x-axis.

The plane is divided into 4 quadrants. Start at the top right (where both coordinates are positive) with I (one), and then counting counterclockwise.

Quadrant I is where both coordinates are positive
Quadrant II is where x is negative and y is positive

Quadrant III is where both coordinates are negative
Quadrant IV is where x is positive and y is negative



Point A (3,-2) Quadrant IV
Point B (-8, 5) Quadrant II
Point C (-3, -6) Quadrant III
Point D (0, 5) y-axis
Point E (-3.5, 0) x-axis

Graphing Linear Equations
Most often come in one of two forms:

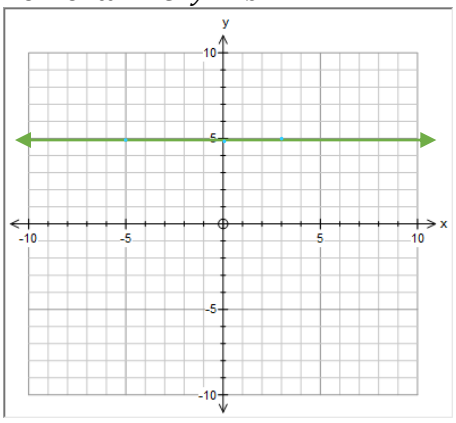
1) Solved for y: $y = 3x + 4$
2) With the variables on one side (standard form): $2x + 3y = 6$

Graphing equations in general involves finding a pair of (x,y) coordinates that satisfies the equation, and then plotting several such pairs and connecting the points.

For the specific case of plotting lines, we only need to find two points.

Special cases of horizontal and vertical lines.

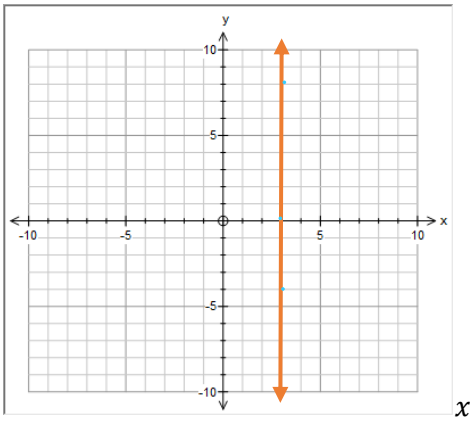
Horizontal line: $y = b$



$y = 5$

Every point on this line has a y-coordinate of 5. Ex. (-5,5), (0,5), (3,5), etc.
X can be anything since there is no relationship to the y-value, which is constant

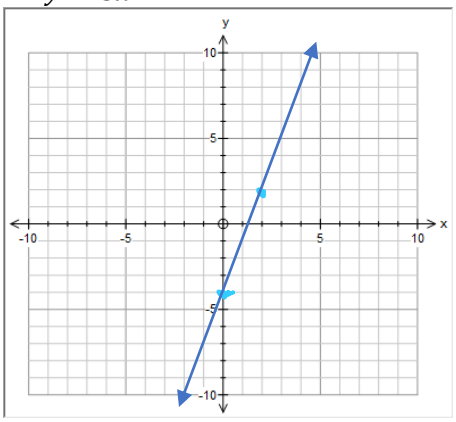
A vertical line: $x = a$



$x = 3$

Every point on this line has 3 as the x-coordinate. Ex. (3,0), (3,-4), (3,8), etc.
There is no relationship between x and y, and we know that x is constant

What if there is a relationship between x and y?
Ex. $y = 3x - 4$



When your equation is solved for y like this, the most natural way of plotting the equation is to pick x-values and use the equation to obtain the corresponding y-values.

Technically, there are no hard and fast rules for how to pick x. It somewhat depends on the equation, and personal preference.

My first point is going to be when x=0. (the math is just easier with this kind of point)

$$y = 3(0) - 4$$
$$y = -4$$

This is a coordinate pair: $(0, -4)$

Then, pick a second x-value and plug that in to get a second coordinate pair.
I'm going to pick x=2

$$y = 3(2) - 4$$
$$y = 6 - 4$$

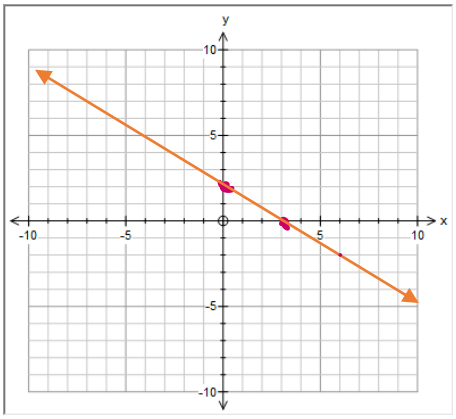
$$y = 2$$

The coordinate pair is (2,2)

If you are working with an line like $y = \frac{1}{3}x + 1$, the it may be helpful to pick multiples of the denominator as the values of x you are plugging into the equation.

The line in standard form:

$$2x + 3y = 6$$



x-intercept is the point on the line where the graph crosses the x-axis (requires that y=0)
y-intercept is the point on the line where the graph crosses the y-axis (requires that x=0)

Plot by finding the two intercepts and then connect the dots.

Set x=0

$$2(0) + 3y = 6$$
$$3y = 6$$
$$y = 2$$

Coordinate point is (0,2)

Set y=0

$$2x + 3(0) = 6$$
$$2x = 6$$
$$x = 3$$

Coordinate point is (3,0)

Pdf Graph paper:
http://betsymccall.net/prof/courses/resources/graphpaper.html
https://www.desmos.com/calculator