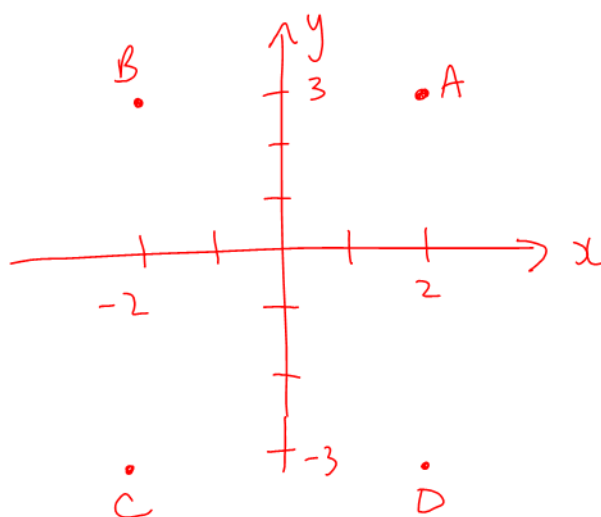


## 1.1 Lines

In this chapter we'll learn how to solve equations and inequalities. This will lead us into solving more applied problems in Chapter 2.

**Example:** Plot the points  $A = (2, 3)$ ,  $B = (-2, 3)$ ,  $C = (-2, -3)$ , and  $D = (2, -3)$ .



**Example:** Consider the line  $21x + 7y = 14$ .

a) Put the equation into the standard form  $y = mx + b$ .

$$\begin{aligned} 7y &= -21x + 14 \\ y &= -3x + 2 \end{aligned}$$

b) What is the slope of the line?

$$m = -3$$

c) What is the  $y$ -intercept of the line?

$b = 2$   
Can also write  $(0, 2)$ .



d) What is the  $x$ -intercept of the line?

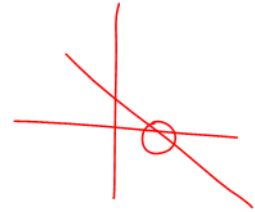
Set  $y=0$  and solve for  $x$ :

$$y=0 \rightarrow 21x + 7y = 14$$

$$21x = 14$$

$$x = \frac{14}{21} = \frac{2}{3}$$

Can also write  $(\frac{2}{3}, 0)$ .



e) Is the point  $(1, -1)$  on the line?

Sub  $x=1, y=-1$ . Is  $21x + 7y = 14$  true?

$$21 - 7 = 14 ?$$

Yes

f) Is the point  $(2, 1)$  on the line?

Sub  $x=2, y=1$ . Is  $21x + 7y = 14$  true?

$$42 + 7 = 14 ?$$

No

**Example:** Graph  $2x + 3y = 12$ .

Find the intercepts.

y-intercept: set  $x = 0$

$$x = 0 \rightarrow 2x + 3y = 12$$

$$3y = 12$$

$$y = 4$$

$$(0, 4)$$

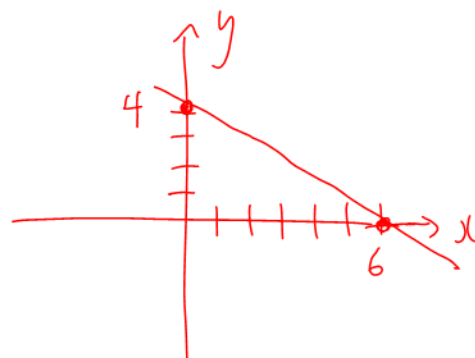
x-intercept: set  $y = 0$

$$y = 0 \rightarrow 2x + 3y = 12$$

$$2x = 12$$

$$x = 6$$

$$(6, 0)$$



**Example:** Graph  $4x + y = 0$ .

$$x = 0 \rightarrow 4x + y = 0$$

$$y = 0$$

$$(0, 0)$$

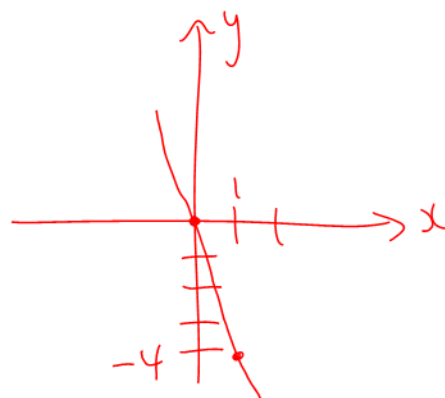
Since the line passes through the origin,  
sub any nonzero x-value to get a second point.

$$x = 1 \rightarrow 4x + y = 0$$

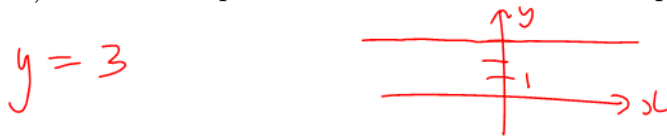
$$4 + y = 0$$

$$y = -4$$

$$(1, -4)$$



**Example:** a) Write the equation of a horizontal line. Graph it.



b) Write the equation of a vertical line. Graph it.



**Example:** Annual car insurance for a certain model of car in a small town costs  $y = 65x + 712$ , where  $y$  is in dollars and  $x$  is the number of years after 2010.

a) What was the cost in 2015?

$$x = 2015 - 2010 = 5$$

$$x = 5 \rightarrow y = 65x + 712$$

$$y = 1037$$

$$\boxed{\$1037}$$

b) In which year was the cost \$1167?

$$y = 1167 \rightarrow y = 65x + 712$$

$$1167 = 65x + 712$$

$$455 = 65x$$

$$7 = x$$

$$x = \text{year} - 2010$$

$$7 = \text{year} - 2010$$

$$2017 = \text{year}$$

$$\boxed{2017}$$

c) Interpret the  $y$ -intercept.

$$x = 0 \rightarrow y = 65x + 712$$

$$y = 712$$

$$(0, 712)$$

$\boxed{\text{In the year 2010, the cost was \$712.}}$