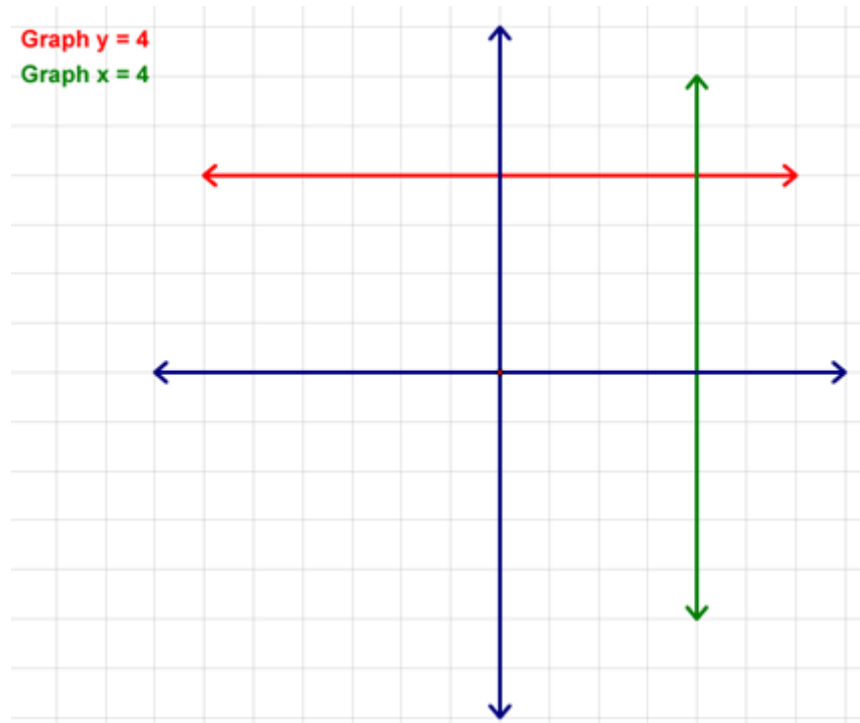




## Equations of Lines - Lesson 13-2

We next recalled how to graph horizontal and vertical lines:



Which is summarized as follows:

### **Theorem 119**

The formula for an equation of a horizontal line is

$$y = b$$

where  $b$  is the  $y$ -coordinate of every point on the line.

### **Theorem 120**

The formula for an equation of a vertical line is

$$x = a$$

where  $a$  is the  $x$ -coordinate of every point on the line.

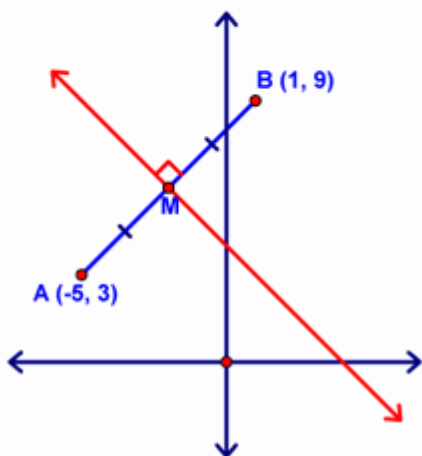


We also learned today how to determine the equation of a line in  $y = mx + b$  format. This is a two-step process:

1. Determine the slope ( $m$ ). This is often accomplished by finding the slope of a line that we know to be parallel or perpendicular to the line we're trying to define. It can also be done by using the slope formula if we know the coordinates of two points on the line.
2. Determine the  $y$ -intercept. This is accomplished by plugging the coordinates of a point we know is on the line into the equation  $y = mx + b$  (remember that we already know  $m$ ) and solving for  $b$ .

So, for example...we might do the following:

Find the equation of the perpendicular bisector of  $\overline{AB}$  where  $A$  has coordinates  $(-5, 3)$  and  $B$  has coordinates  $(1, 9)$ .



Now, the slope of  $\overline{AB}$  is  $\frac{9 - 3}{1 - (-5)} = \frac{6}{6} = 1$ .

Therefore, the slope of the  $\perp$  bisector is  $-1$ .

Since we know  $M$  is on the  $\perp$  bisector, we should find its coordinates.  $M$  is the midpoint of  $\overline{AB}$ , so its coordinates are  $\left(\frac{-5 + 1}{2}, \frac{3 + 9}{2}\right) = (-2, 6)$

So, our line has equation  $y = -1x + b$ , but we know  $(-2, 6)$  is on it, so we can use these coordinates to solve for  $b$ , the  $y$ -intercept:

$$6 = -1(-2) + b$$

$$\Rightarrow b = 6 - 2 = 4$$

And our line has equation  $y = -x + 4$