Section 7.1c – Slope Intercept Form – Part 3

This booklet belongs to:______________________________Block: ______

Writing the Equation of a Line

- We can also **identify information in a graph** that will allow us to write the equation of a line.
- This technique is limited to **SLOPE-INTERCEPT FORM** and graphs where the $y - intercept$ is easily discernible.

❖ What is the equation of the given line?

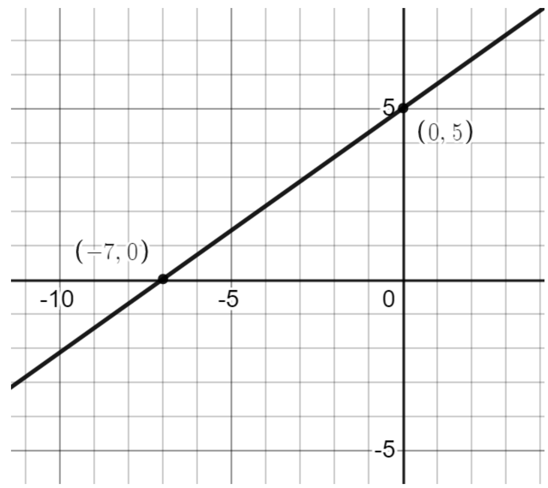
- **Identify the Slope and the $\boldsymbol{y - intercept}$** and you're done

- The $y - intercept$ is easy to see: $(\mathbf{0}, \mathbf{5})$
- Now from left to right, count the **SLOPE**
- **Our RUN:** We move **7** places in the **positive direction**
- **Our RISE:** We move **5** places up in the **positive direction**

So, the **SLOPE** is: $\frac{\mathbf{5}}{\mathbf{7}}$

The Equation of the line then is:

$$y = \frac{5}{7}x + 5$$



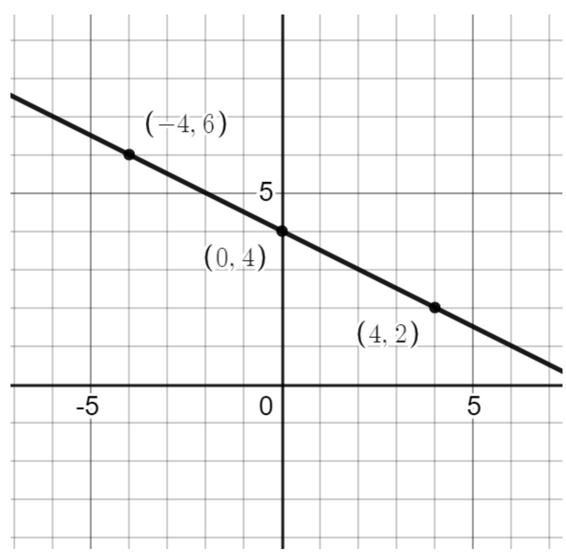
Try another one:

- The $y - intercept$ is easy to see: $(\mathbf{0}, \mathbf{4})$
- Now from left to right, count the **SLOPE**
- **Our RUN:** We move **8** places in the **positive direction**
- **Our RISE:** We move **4** places up in the **negative direction**

So, the **SLOPE** is: $\frac{\mathbf{-4}}{\mathbf{8}} = \frac{\mathbf{-1}}{\mathbf{2}} = -\frac{\mathbf{1}}{\mathbf{2}}$

The Equation of the line then is:

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



Graphing Lines

- With the **SLOPE-INTERCEPT** equation it is pretty easy to graph lines too.
- We are given the **SLOPE** and the **Y-INTERCEPT**, so it is really quite simple.

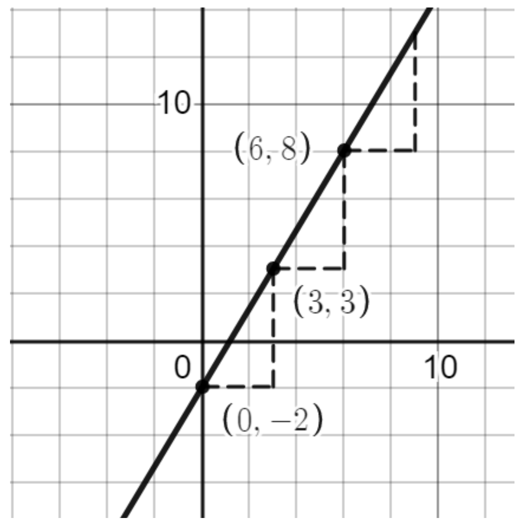
❖ **Identify** the $y - intercept$ from the equation and plot it
❖ Then from that point, **count out your SLOPE**
❖ Up and left, up and right, down and left, or down and right

Graph this: $y = \frac{5}{3}x - 2$

$y - intercept$: $(0, -2)$

$Slope$: $\frac{Rise}{Run} = \frac{5}{3}$

Always start by plotting your $y - intecept$ and then drawing the rise/run behaviour of your slope to identify the next intersection point!

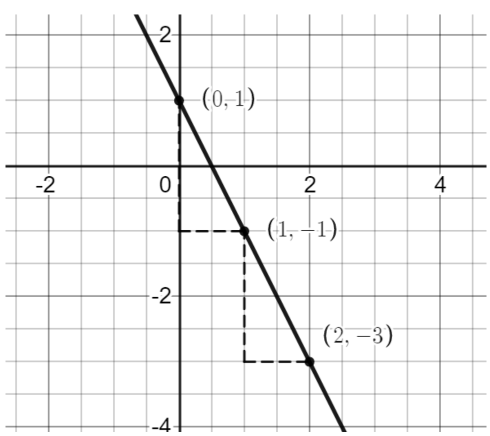


Let's try a couple more:

Graph: $y = -2x + 1$

$y - intercept$: $(0,\ 1)$

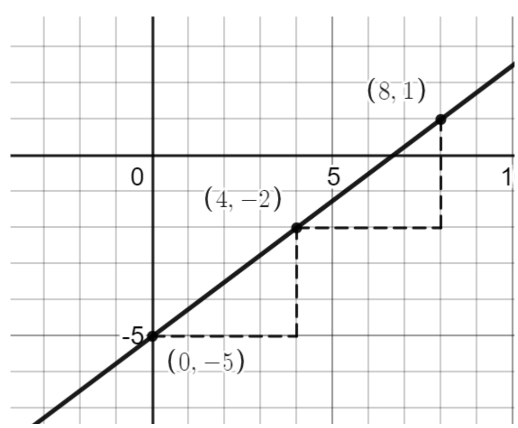
$Slope$: $\frac{Rise}{Run} = \frac{-2}{1}$



Graph: $y = \frac{3}{4}x - 5$

$y - intercept$: $(0, -5)$

$Slope$: $\frac{Rise}{Run} = \frac{3}{4}$

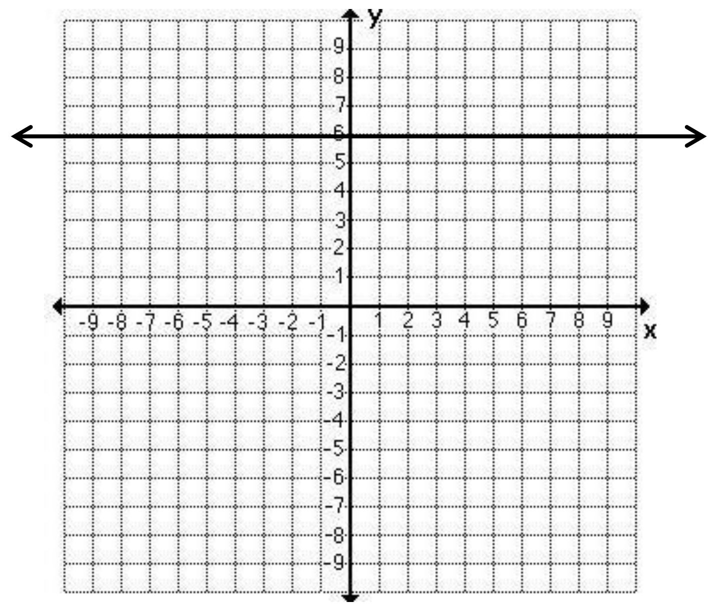


Obviously, once the line is present, we erase the dotted lines, they only show the Slope Behaviour here.

Equations of Vertical and Horizontal Lines

Horizontal Lines

Let's look at an example:



- What is the Slope?
- What is the $y - intercept$?

So, the **Slope is 0**, and the $\boldsymbol{y - intercept}$ is 6.

- But when else is $y = 6$?
- Does it matter what the $x - value\ is$?
- So, do we even need x in our equation?

It turns out that every horizontal line is simply:

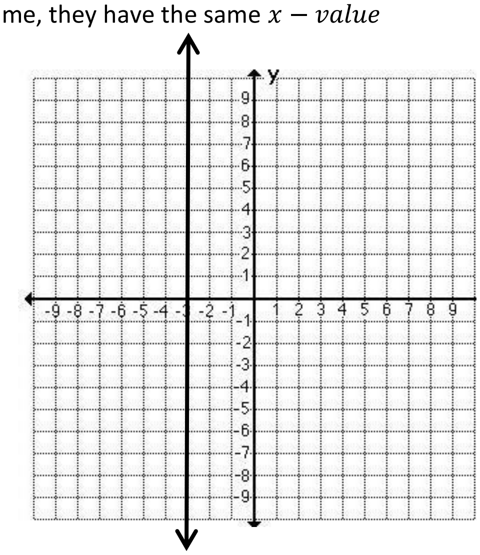
$$\boldsymbol{y = b}$$

So, in this case, the equation of the horizontal line is:

$$\boldsymbol{y = 6}$$

Vertical Lines

- Vertical lines don't have the same $y - value$ all the time, they have the same $x - value$
- So, does the $y - value$ matter?
- Do we need it in our equation?



It turns out that every vertical line is simply:

$$\boldsymbol{x = a}$$

So, in this case, the equation of the vertical line is:

$$\boldsymbol{x = -3}$$

It can seem counterintuitive because the $x - axis$ is a Horizontal Line ($y = 0$) and the $y - axis$ is a vertical lin e($x = 0$), but just consider the behaviour and the points that make up the two types of lines and you can avoid the potential confusion!

Summary

$y = mx + b$ Is the equation for a diagonal line **(Slope-Intercept)**

$y = ?$ Is the equation of a **Horizontal line** $x = ?$ Is the equation of a **Vertical line**

b Is the value of the $\boldsymbol{y - intercept}$

(x, y) The **coordinates** of the **point** on a line (also the **Solution** to the **Equation**)

m Is the **Slope,** written: $\frac{Rise}{Run} = \frac{Change\ in\ height}{change\ in\ length} = \frac{Change\ in\ y}{Change\ in\ x} = \frac{y_2 - y_1}{x_2 - x_1}$

Remember when counting out the Slope

You have a fraction so you can count **4 possible ways**:

The first two give you a consistent **POSITIVE SLOPE** regardless of the direction you count

i) **Up and to the Right** (POSITIVE RISE/POSITIVE RUN) $\frac{A}{B}$ which equals $\frac{A}{B}$

ii) **Down and to the Left** (NEGATIVE RISE/NEGATIVE RUN) $\frac{-A}{-B}$ which equals $\frac{A}{B}$

The second two give you a consistent **NEGATIVE SLOPE** regardless of the direction you count

iii) **Down and to the Right** (NEGATIVE RISE/POSITIVE RUN) $\frac{-A}{B}$ which equals $-\frac{A}{B}$

iv) **Up and the Left** (POSITIVE RISE/NEGATIVE RUN) $\frac{A}{-B}$ which equals $-\frac{A}{B}$

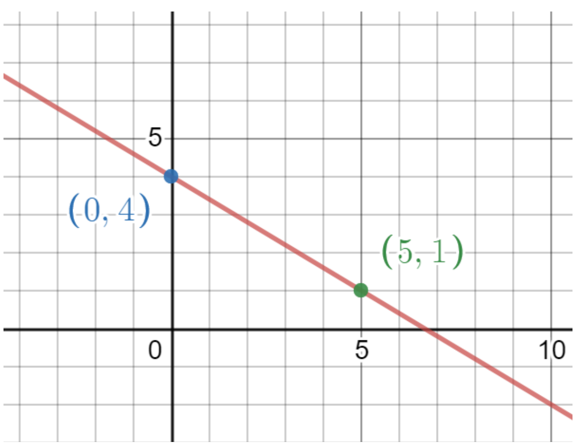
Section 7.1c – Practice Problems

Find the slope of the lines that go through the following points

1. $(3, 4)$ *and* $(6, -7)$
2. $(-3, 8)$ *and* $(1, -7)$
3. $(0, 4)$ *and* $(5, 0)$
4. $(4, 4)$ *and* $(1, 1)$
5. $(-9, -10)$ *and* $(-3, -7)$
6. $(1, 9)$ *and* $(-4, 9)$

Write the equation of the lines on the grids below

7.



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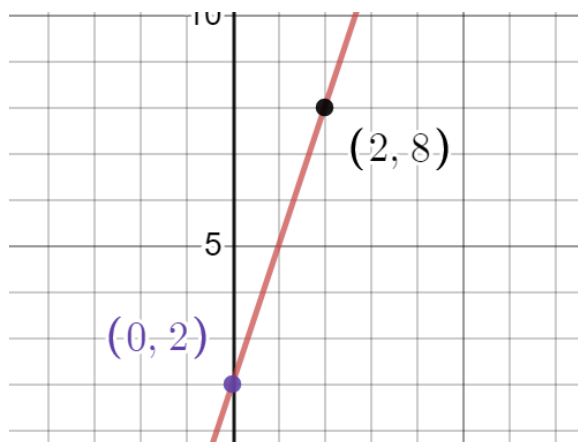

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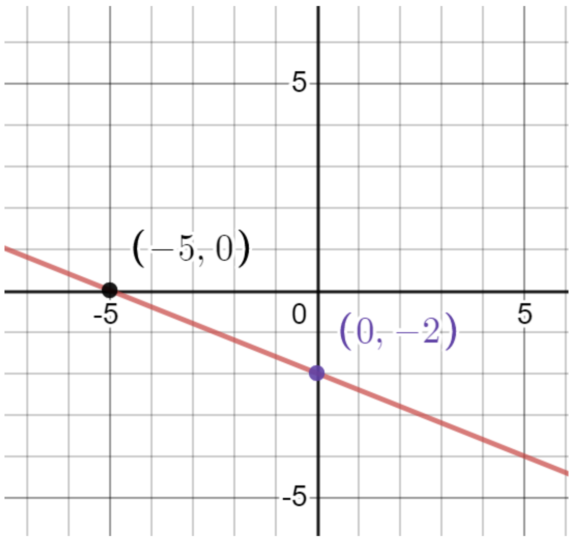

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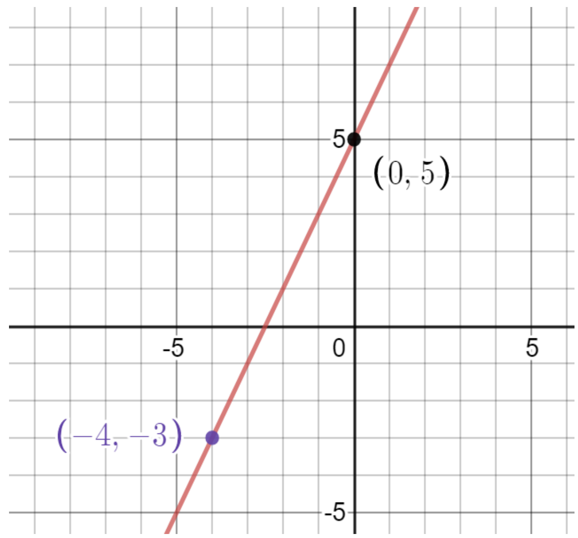

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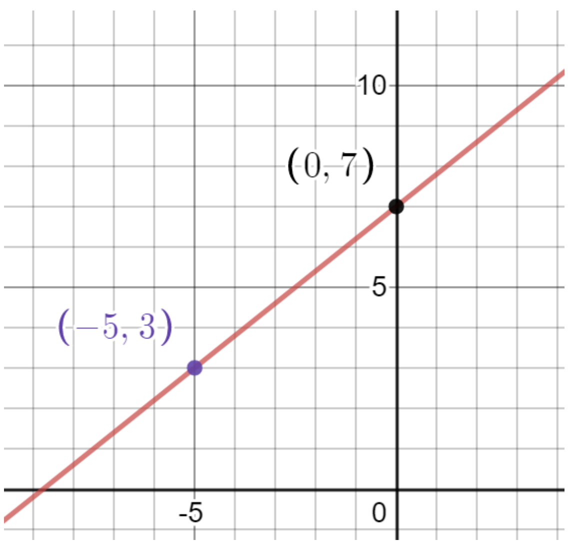

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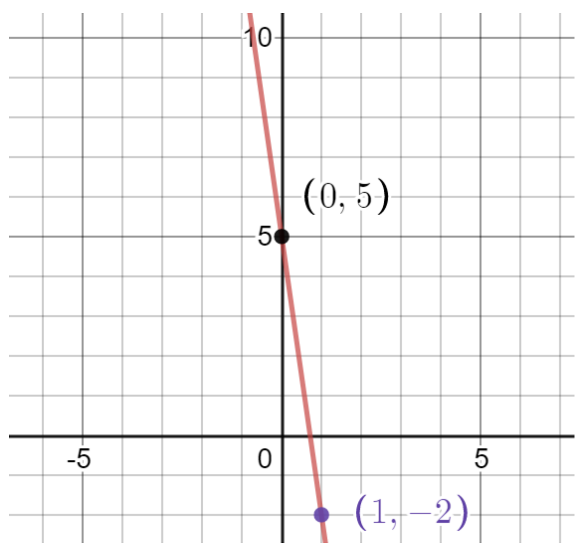
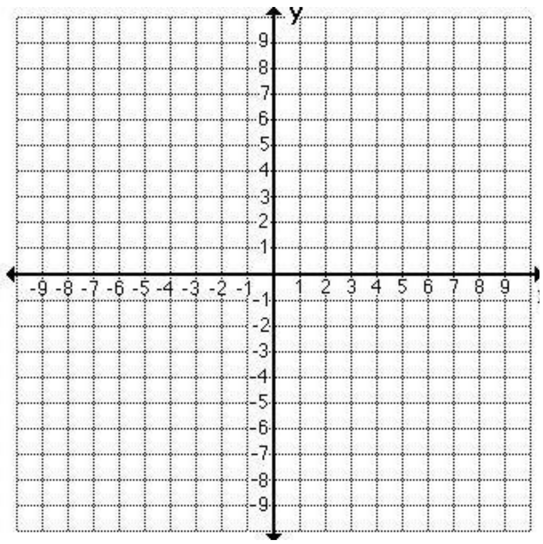
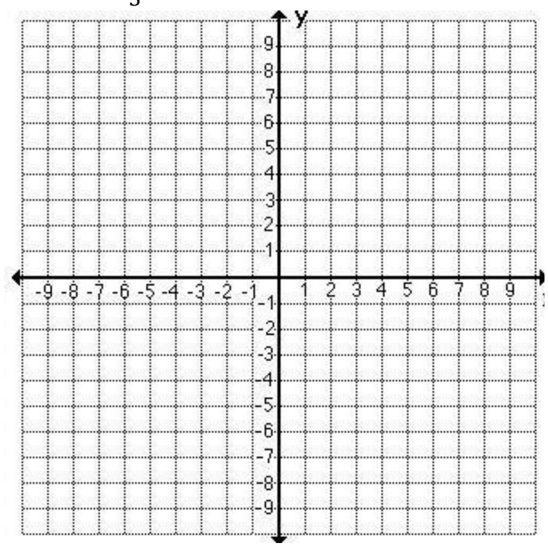


13. Graph the following lines. Show the mapping of the Slope from at least one point to another

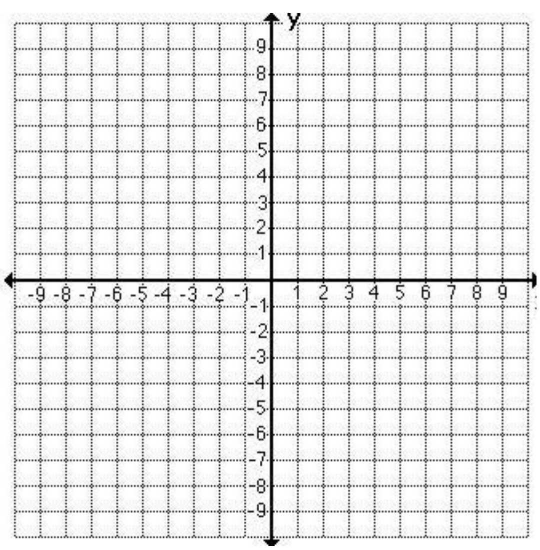
$a)$ $y = x$



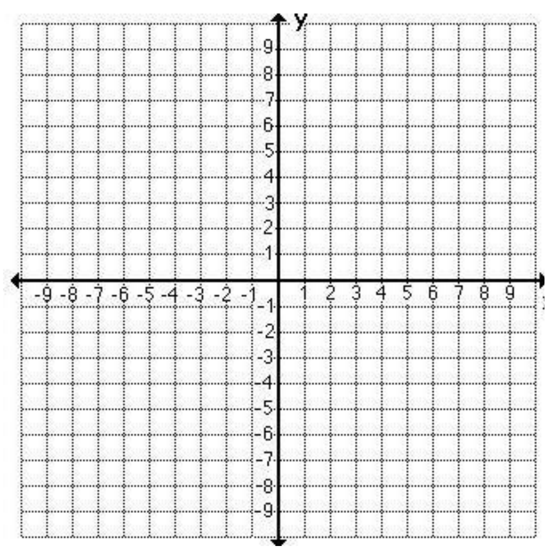
$b)$ $y = \frac{2}{5}x + 4$



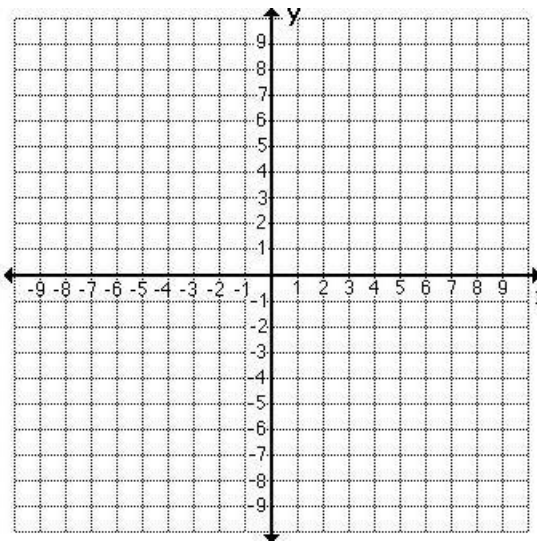
$c)$ $y = -2x + 7$



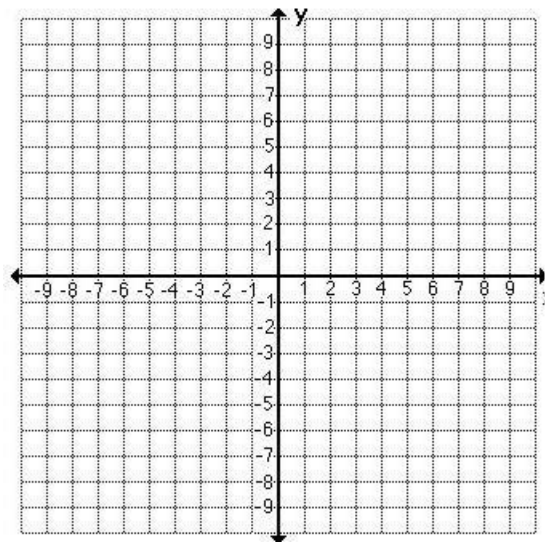
$d)$ $y = -\frac{3}{5}x - 5$



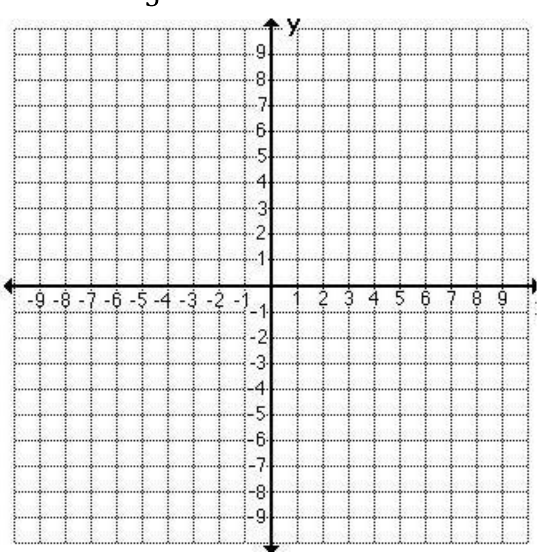
$e)$ $y = 3$



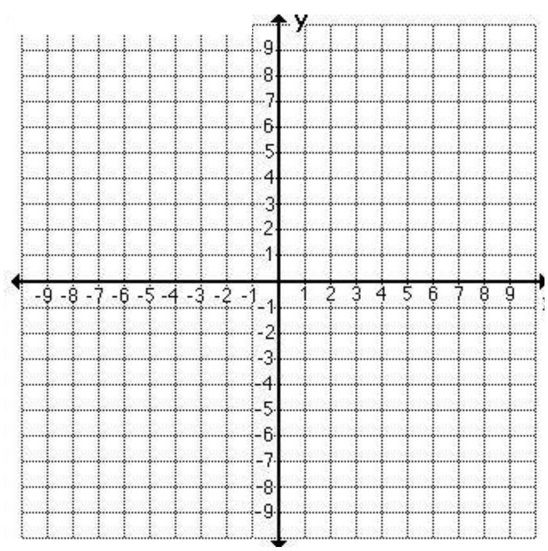
$f)$ $x = -4$



$g)$ $y = -\frac{8}{5}x + 4$



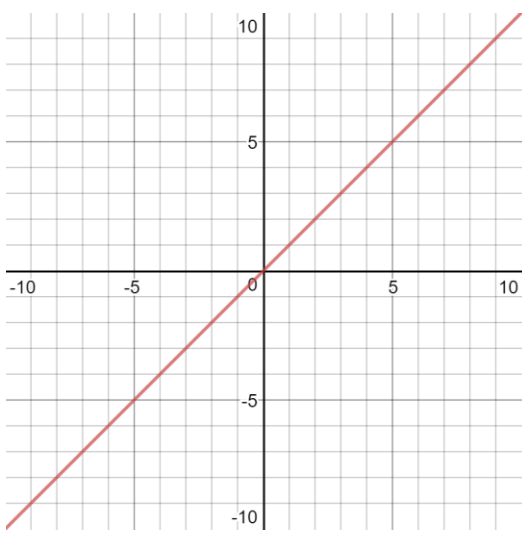
$h)$ $y = 2x - 6$



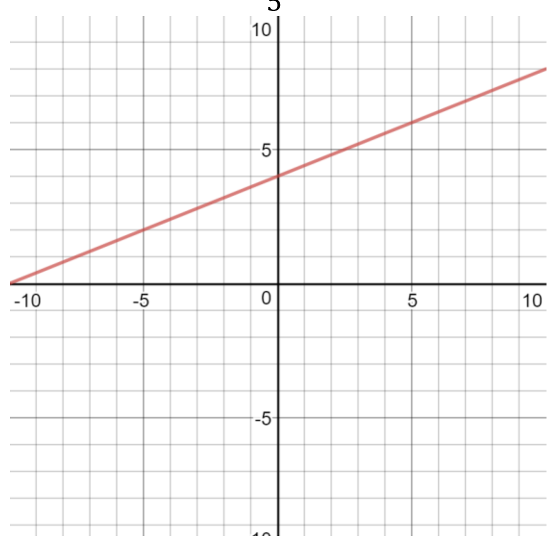
Section 7.1c – Answer Key

1. $-\frac{11}{3}$
2. $-\frac{15}{4}$
3. $-\frac{4}{5}$
4. 1
5. $\frac{1}{2}$
6. 0
7. $y = -\frac{3}{5}x + 4$
8. $y = 3x + 2$
9. $y = -\frac{2}{5}x - 2$
10. $y = 2x + 5$
11. $y = \frac{4}{5}x + 7$
12. $y = -7x + 5$
13.

$a)$ $y = x$

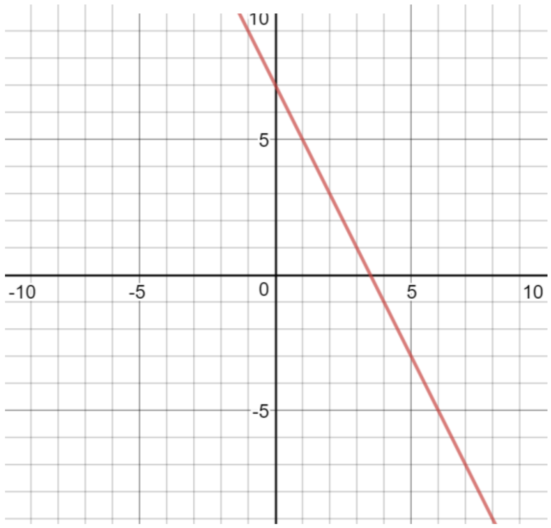


$b)$ $y = \frac{2}{5}x + 4$



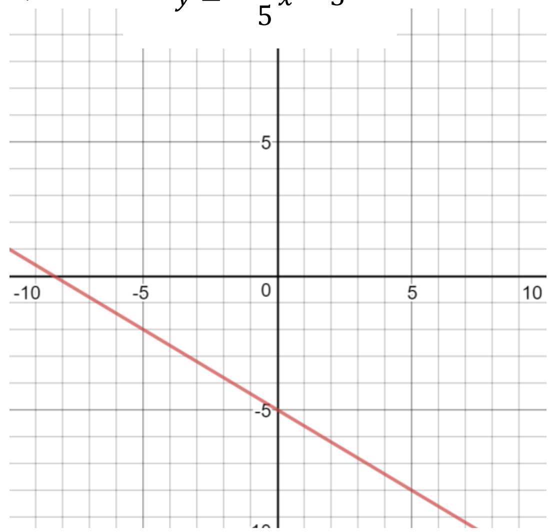
$c)$

$$y = -2x + 7$$



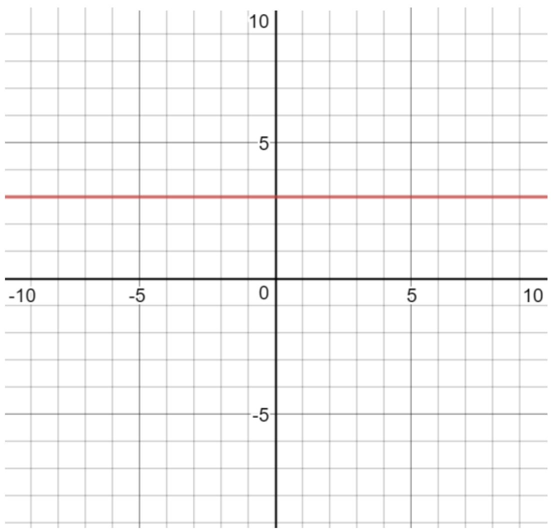
$d)$

$$y = -\frac{3}{5}x - 5$$



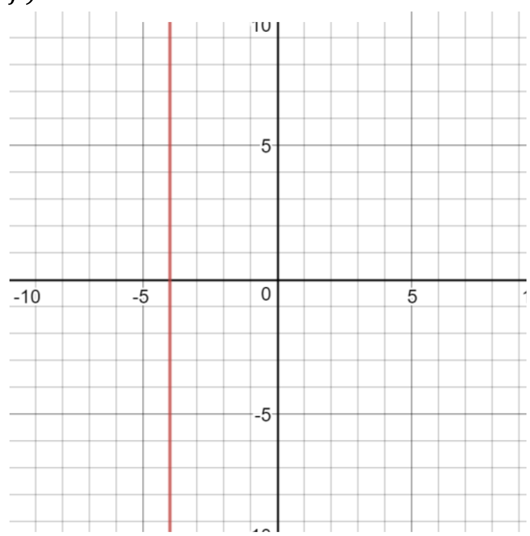
$e)$

$$y = 3$$



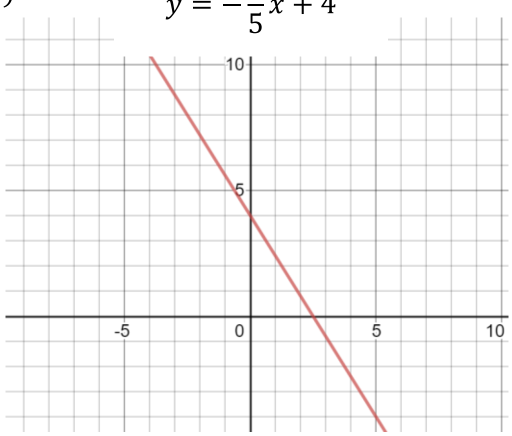
$f)$

$$x = -4$$



$g)$

$$y = -\frac{8}{5}x + 4$$



$h)$

$$y = 2x - 6$$