

# MTH 150 PRJT 2

Tyler Gaspar

October 2021

## 1 Section 2.1

P.110

1. A town's population has been growing linearly. In 2003, the population was 45,000, and the population has been growing by 1700 people each year. Write an equation,  $P(t)$ , for the population  $t$  years after 2003.

$$P = \text{initial}45,000\text{residents} | t = \text{ofnewresidentsperyear}$$
$$P(t) = 45,000 + 1,700t$$

Reflection: The problem here we discussed in class and peer participated not one sides to understand the new chapter material. Once I figured it out the rest of the problem unfolded and made sense to me.

2. A town's population has been growing linearly. In 2005, the population was 69,000, and the population has been growing by 2500 people each year. Write an equation,  $P(t)$ , for the population  $t$  years after 2005.

$$P = \text{initial}69,000\text{residents} | t = \text{ofnewresidentsperyear}$$
$$P(t) = 69,000 + 2,500t$$

Reflection: The problem here is identical to the one above and went over during class as well. Reading for the keywords plug the numbers into an equation and the result is the one above.

5. Timmy goes to the fair with 40. Each ride costs 2. How much money will he have left after riding  $n$  rides?

insert graph

Reflection: The problem here I needed to demonstrate how to be able to read a T-chart problem and piecing it together as shown. An equation that helps understand the graph is  $40 - 2n$ . 40 is the total started with at the beginning, and n represents number of rides.

17. Find the slope of the line that passes through two given points?

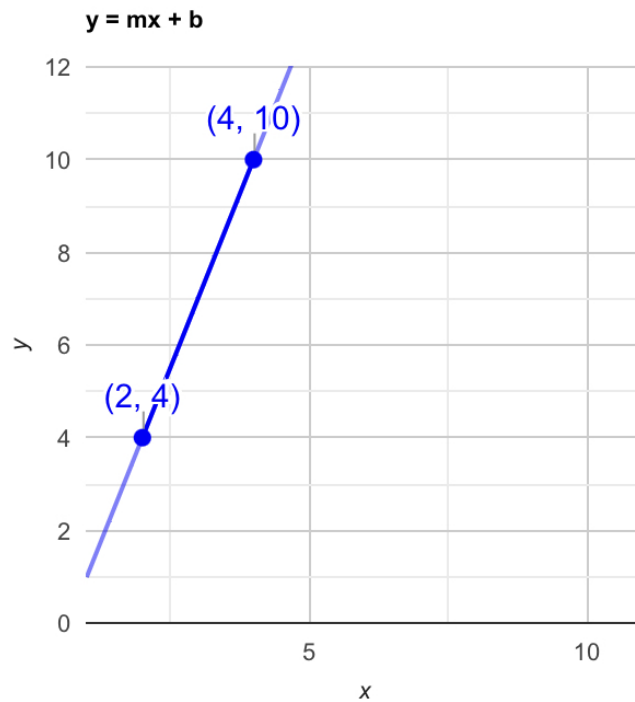
(2,4) (4,10)

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{10 - 4}{4 - 2}$$

$$\frac{6}{2}$$


$$3$$

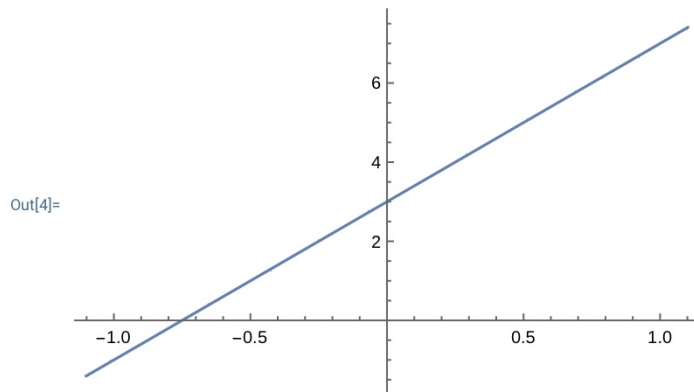


Reflection: In this problem you have separate the problem into three pieces: understanding the equation, replacing variables, and graph. Once all the steps were completed the problem was easy to understand.

7. Determine if each function is increasing or decreasing?  
 $f(x) = 4x + 3$

Answer: The graph and equation show that the problem is increasing


In[4]:=  **graph f(x) = 4x+3**

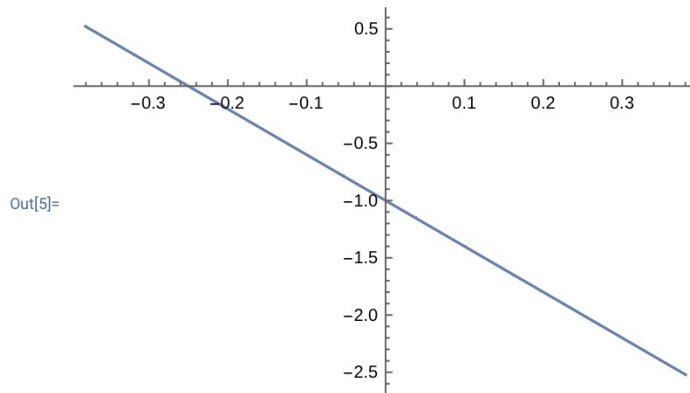


Refelction: This problem was solved based on an example from class; hence, me solving the problem easily. In addition, learning that day that in Mathematica users can type concisely in english math questions and the search query answers as answered if typed in code.

12. Determine if each function is increasing or decreasing?

$$k(x) = -4x - 1$$

In[5]:  graph k(x) = -4x -1



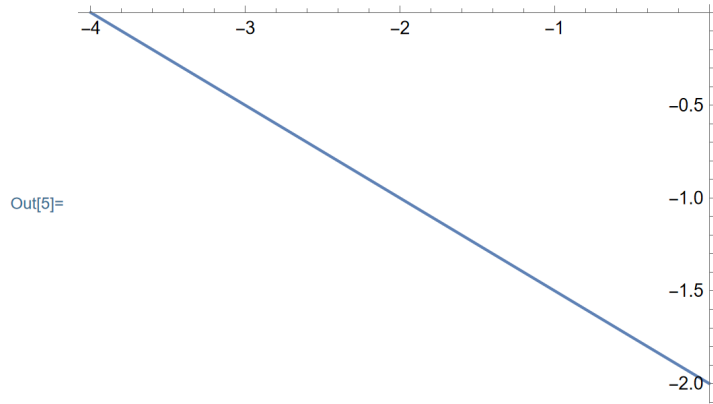
Answer: The graph and equation show that the problem is decreasing

Reflection: As the answer states this is decreasing and is justified by the math, aka  $-1/4x$  and the plotted graph. No issues present here and understood it.

## 2 Section 2.2

Pg.125-127

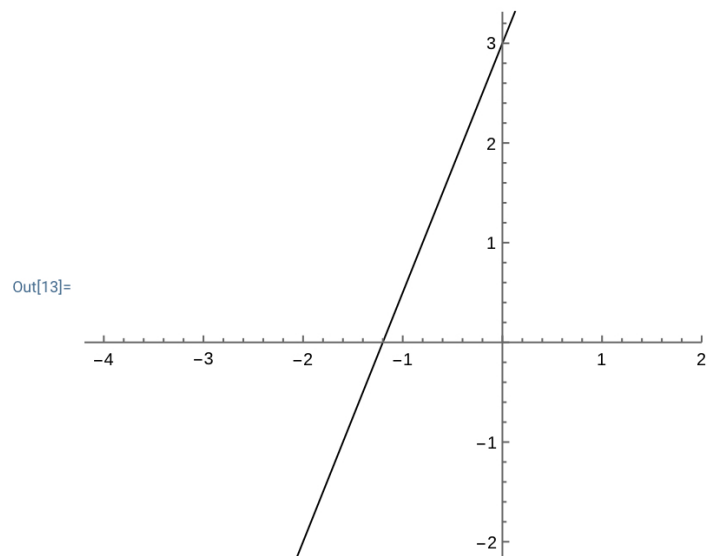
7. An x-intercept of  $(-4, 0)$  and y-intercept of  $(0, -2)$



Reflection: This problem was somewhat challenging due to the struggles of adding the graphs; main issue from last week. Once compiled inserting the problem was easy as well understanding what the problem was asking to do.

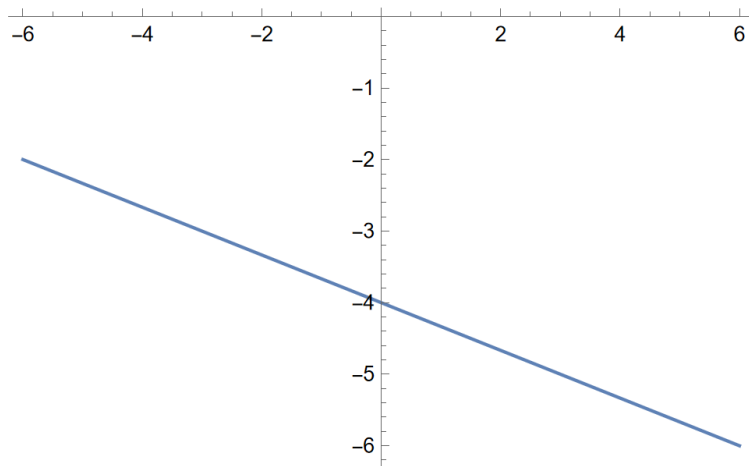
10. A vertical intercept of  $(0, 3)$  and slope  $5/2$

In[13]: `= plot (0, 3) and slope 5/2`



Reflection: In this section finding the right code function for Mathematica was difficult to find. The screenshot shows the code that stuck and worked here. The problem itself doable and readable.

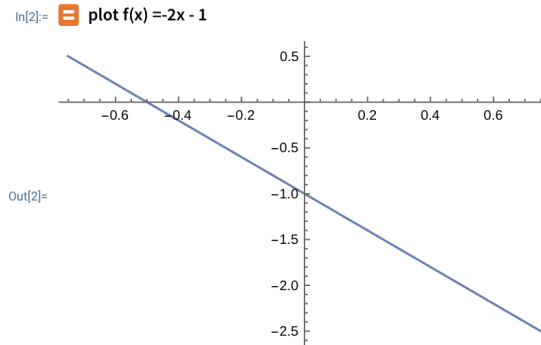
11. Sketch a line with the given features: Passing through the points  $(-6,-2)$  and  $(6,-6)$



Reflection: Here, Mathematica was needed in order to compile the points passing through correctly. After my previous attempts with inserting and creating graphs I understood it better.

13. Sketch the graph of each equation:

$$f(x) = -2x - 1$$



$$y = 1/2x$$

Reflection: This problem is similar to other problems above to compute in Mathematica and plot the graph in the pdf here. Overall, no issues typing and understanding what the question asked me to do.

23. If  $g(x)$  is the transformation of  $f(x) = x$  after a vertical compression by the  $3/4$ , a shift left by 2 a down by 4

Answer: B - What is the slope of the line?

Reflection: The problem above was easy to understand without error or difficulty. Based on prior knowledge from the beginning of high school understanding basics about slope and graphs.

29. Find the horizontal and vertical intercepts of each equation

y-int

$$f(x) = x + 2$$

$$y = -(0) + 2$$

$$y = 2$$

$$(0, 2)$$

x-int

$$0 = -x + 2$$

$$-2 = -x$$

$$x = 2$$

$$(2,0)$$

Reflection: The problem was easy to understand and of the few that clicked. Thinking back to a lot of my high school material is rough especially the way the pandemic has impacted my memory and comprehension of topics, this was the sliver that made it.

37. Given below are descriptions of two lines. Find the slopes of Line 1 and Line 2. Is each pair of lines parallel, perpendicular or neither?

Line 1: Passes through (2,3) and (4, 1)

Line 2: Passes through (6,3) and (8,5)

Answer: Line 1  $\frac{y_2 - y_1}{x_2 - x_1}$

$$\frac{1-3}{4-2}$$

$$\frac{-2}{2}$$

$$-1$$

Answer: Line 2  $\frac{y_2 - y_1}{x_2 - x_1}$

$$\frac{5-3}{8-6}$$

$$\frac{2}{2}$$

$$1$$

Reflection: At first this problem did create a conundrum because I didn't know where to begin. I believed a graph was needed and nothing clicked until I stepped back and re-read the question. The answer came to me once I did and here are my answers.



41. Write an equation for a line parallel to  $f(x) = 5x + 3$  and passing through the point  $(2, -12)$

$$f(x) = -5x - b$$

$$-12 = -5(2) - b$$

$$b = 12 - 10$$

$$b = 2$$

$$y = 5x - 2$$

Reflection: This was one of the problems in the section that gave me trouble to understand, but overcame it once I resourced to a Khan Academy video on the subject. Once I understood what I was dealing with it was easy to code in Mathematica and paste here.

### 3 Section 2.3

Pg. 137-139

1. In 2004, a school population was 1001. By 2008 the population had grown to 1697. Assume the population is changing linearly.

a. How much did the population grow between the year 2004 and 2008?

Answer: 696

b. How long did it take the population to grow from 1001 students to 1697 students?

Answer: 4 years

c. What is the average population growth per year?

Answer: 174 people per year

d. What was the population in the year 2000?

Answer: In the year 2000, it is estimated that the population is 305.

e. Find an equation for the population,  $P$ , of the school  $t$  years after 2000.

Answer:  $P = 174t + 305$

f. Using your equation, predict the population of the school in 2011.

Answer: 2219

Reflection: This was the sections most understandable problem because like others I was able to pull out resources from experience in high school to solve the similar problems.

2. In 2003, a town's population was 1431. By 2007 the population had grown to 2134. Assume the population is changing linearly.

a. How much did the population grow between the year 2003 and 2007?

Answer: 703

b. How long did it take the population to grow from 1431 people to 2134 people?

Answer: 4 years

c. What is the average population growth per year?

Answer: 175.75 people per year

d. What was the population in the year 2000?

Answer: In the year 2000, it is estimated that the population is 903.75.

e. Find an equation for the population,  $P$ , of the town  $t$  years after 2000.

Answer:  $P = 175.75t + 903.75$

f. Using your equation, predict the population of the school in 2014.

Answer: 3364.25

Refelction: Basically, the same response above and is the same style question to solve. Therefore, no problems here.

13. Find the area of a triangle bounded by the  $y$ -axis, the line  $f(x) = 9 - \frac{6}{7}x$  and the line perpendicular to  $f(x)$  that passes through the origin.

$$m_1 m_2 = -1 \rightarrow m_1 = -6/7, m_2 = 7/6$$

The equation would be  $f(x) = 7/6x$

Second Randomly take two point on a graph

$$\frac{45-15}{25-24}$$

30

Answer: 30 square meters

Reflection: In this problem using resources such as Khan academy and Youtube videos on the topic. I was able to solve the problem in 15 minutes with through analysis.

,

18. Find the value of  $m$  so the lines  $f(x) = mx + 5$  and  $g(x) = x$  and the  $y$ -axis form a triangle with an area of 10.

Breakdown:

$$1/2 \times 5 \times h = 10$$

$$h = 10/3$$

$$10/3 = 10/3m + 5$$

$$10/3m = -6/3$$

Answer: The value of  $m$  equals 0.60

Reflection: Just like the problem above additional material was needed in order to solve the problem here. By going to Youtube and the book summary I was able to solve the problem as so.

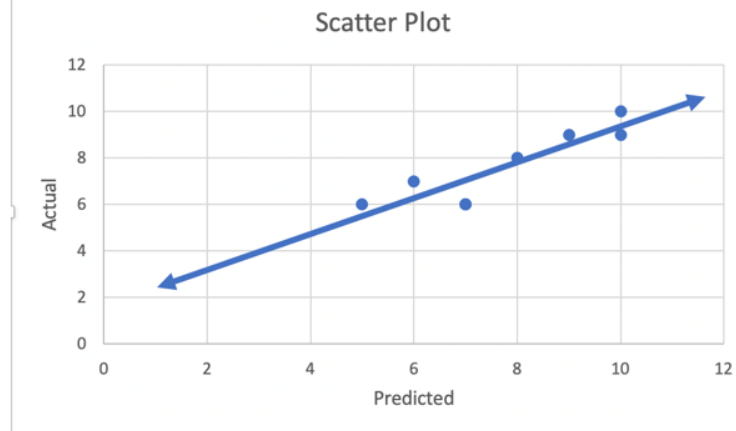
## 4 Section 2.4

Pg.147-148

2. Eight students were asked to estimate their score on a 10 point quiz. Their estimated and actual scores are given. Plot the points, then sketch a line that fits the data.

Predicted	Actual
5	6
7	6
6	7
8	8
10	9
9	9
10	10
7	6

Answer:



Reflection: I love scatter plots or analyzing data. I find it one of the most fascinating aspects of science and math just to process and compile sums of data and translate it is exciting and easy.

3. Based on each set of data given, calculate the regression line using your calculator or other technology, and determine the correlation coefficient.

x	y
8	23
15	41
26	53
31	72
56	103

Had difficulty translaing the work here I will email picture of work

Answer:  $y = 1.6397x + 13.7998$ ;  $r = 0.9873$

Reflection: This is the difficult problem of the section. For me finding the answer was looking for a needle in a haystack just because I'm unfamiliar with the topic.

6. Based on each set of data given, calculate the regression line using your calculator or other technology, and determine the correlation coefficient.

x	y
4	44.8
5	43.1
6	38.8
7	39
8	38
9	32.7
10	30.1
11	29.3
12	27
13	25.8
14	24.7
15	22
16	20.1
17	19.8
18	16.8

Answer:  $y = -1.9789x + 51.9015$ ;  $r = -0.9914$

Reflection: This problem led to a lot of problems especially realizing what was asked. Truthfully the answer above is a big guess based on a few crunched numbers, right or wrong just want to be honest.

8. A regression was run to determine if there is a relationship between the diameter of a tree (x, in inches) and the tree's age (y, in years). The results of the regression are given below. Use this to predict the age of a tree with a diameter of 10 inches.

$$y = ax + b$$

$$a = 6.301$$

$$b = -1.044$$

$$r^2 = 0.940$$

$$r = 0.970$$

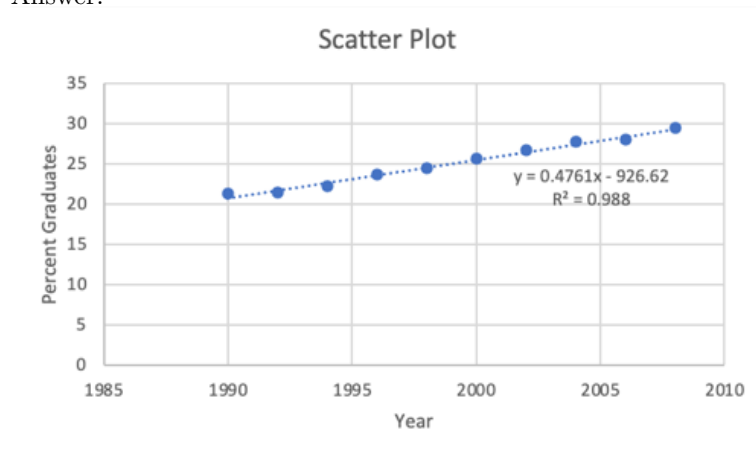
Answer: A tree with a diameter of 10 inches is predicted to have an age of about 61.966 years old.

Reflection: In this problem I simply needed to plug in the question's variables into the equation and go from there. I had no issues solving the problem above.

13. The US census tracks the percentage of persons 25 years or older who are college graduates. The data for several years is given below. Determine if the trend appears linear. If so and the trend continues, in what year will the percentage exceed 35%?

Year	Percent Graduates
1990	21.3
1992	21.4
1994	22.2
1996	23.6
1998	24.4
2000	25.6
2002	26.7
2004	27.7
2006	28.0
2008	29.4

Answer:



The trend appears linear, and it is predicted that the percentage of students will exceed 35% by 2020.

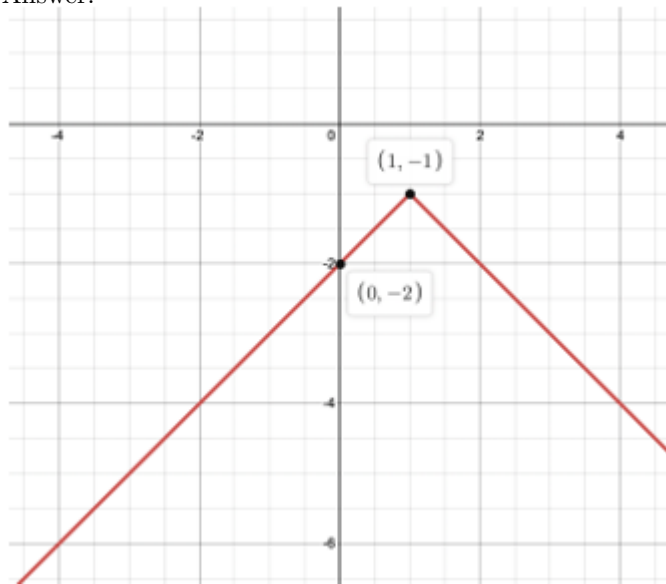
Reflection: This problem just like the data problems in prior sections were easy to organize and plot here and in mathematica. No issues that i can think of in terms of solving this.

## 5 Section 2.5

Pg.156-157

5. Sketch a graph of each function:  $f(x) = -|x-1| - 1$

Answer:

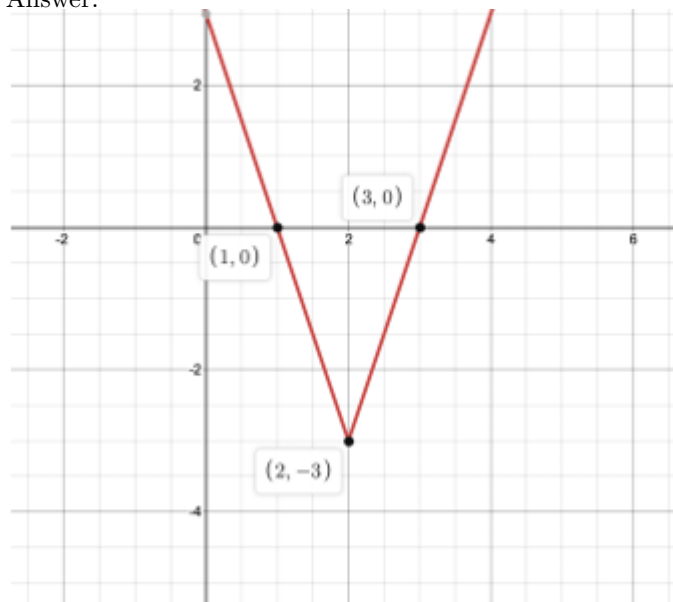


Reflection: Because this problem is designed to be graphed and hence my answer. The issue I had is that I used desmos instead; given the fact I'm more comfortable with the platform than mathematica on graphing.



8. Sketch a graph of each function:  $f(x) = 3|x - 2| - 3$

Answer:



Reflection: as previously stated this problem was made in desmos because of past experience in high school using this for graphing project, seemed fitting here to use. I wish to learn in Mathematica how to graph but will do what I must to solve the equation.

11. Solve each equation:  $|5x - 2| = 11$

Answer:  $x = \frac{13}{5}, \frac{-9}{5}$

$$-5x - 2 = 11 \quad \text{or} \quad 5x - 2 = 11$$

$$5x - 2 = -11$$

First Solution:  $5x = 13 \quad \text{or} \quad x = \frac{13}{5}$

Second Solution:  $5x = -9 \quad \text{or} \quad x = \frac{-9}{5}$

Reflection: Here in this solution I found solving this problem easy than most in this section. To confirm whether my work is correct I used Mathematica and

Microsoft problem solver to confirm a) my thoughts and b) math work.

16. Solve each equation:  $5|x - 4| - 7 = 2$

Answer:  $x = \frac{29}{5}, \frac{11}{5}$

$$5x - 4 = 9$$

$$-x - 4 = 9/5$$

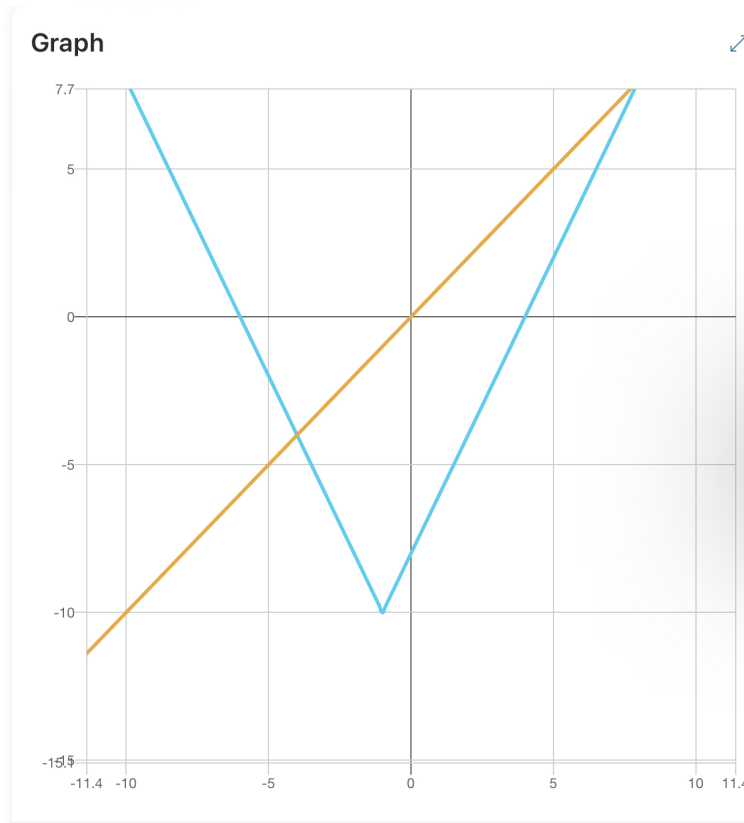
$$-x - 4 = -9/5$$

$$x = 29/5$$

$$x = 11/5$$

Reflection: Likewise, this problem is the same as the one above. No issues require since I had an example to bank off of.

17. Find the horizontal and vertical intercepts of each function:  $f(x) = 2|x + 1| - 10$



Answer: Horizontal intercepts are  $(4, 0)$  and  $(-6, 0)$ ; Vertical intercepts are  $(0, -8)$

Refelction: The answer here is shown in the image here highlighting the intercept on the graph using Microsoft Solver. Once calculated my work shows that this is proved true.

20. Find the horizontal and vertical intercepts of each function:  $f(x) = -2|x + 1| + 6$

Answer: Horizontal intercepts are  $(2, 0)$  and  $(-4, 0)$ ; Vertical intercepts are  $(0, 4)$

Refelction: A repeat of the question above asks readers to uncover the vertical and horizontal and by graphing it with Microsoft Solver, I had difficulty trying in Mathematica, the reason why I resourced myself.

23. Solve each inequality:  $|x - 2| \geq 3$

Answer:  $(-\infty, -1] \cup [5, \infty)$

$$x - 2 - 3$$

$$x - 1$$

$$x - 23$$

$$x5$$

Refelction: This problem I was able to solve simply by going over notes from high school I had in my digital notebook and re-reading inequalities. Once I did that I applied it here and go the answers I have.

26. Solve each inequality:  $|2x - 9| \leq 8$

Answer:  $[\frac{1}{2}, \frac{17}{2}]$

$$2x - 9 \leq -8$$

$$x \leq 1/2$$

$$2x - 9 \leq 8$$

$$x \leq 17/2$$

Reflection: In the final problem of the project I recalled the last problem on how to solve this here. No issues had here and finished swiftly.