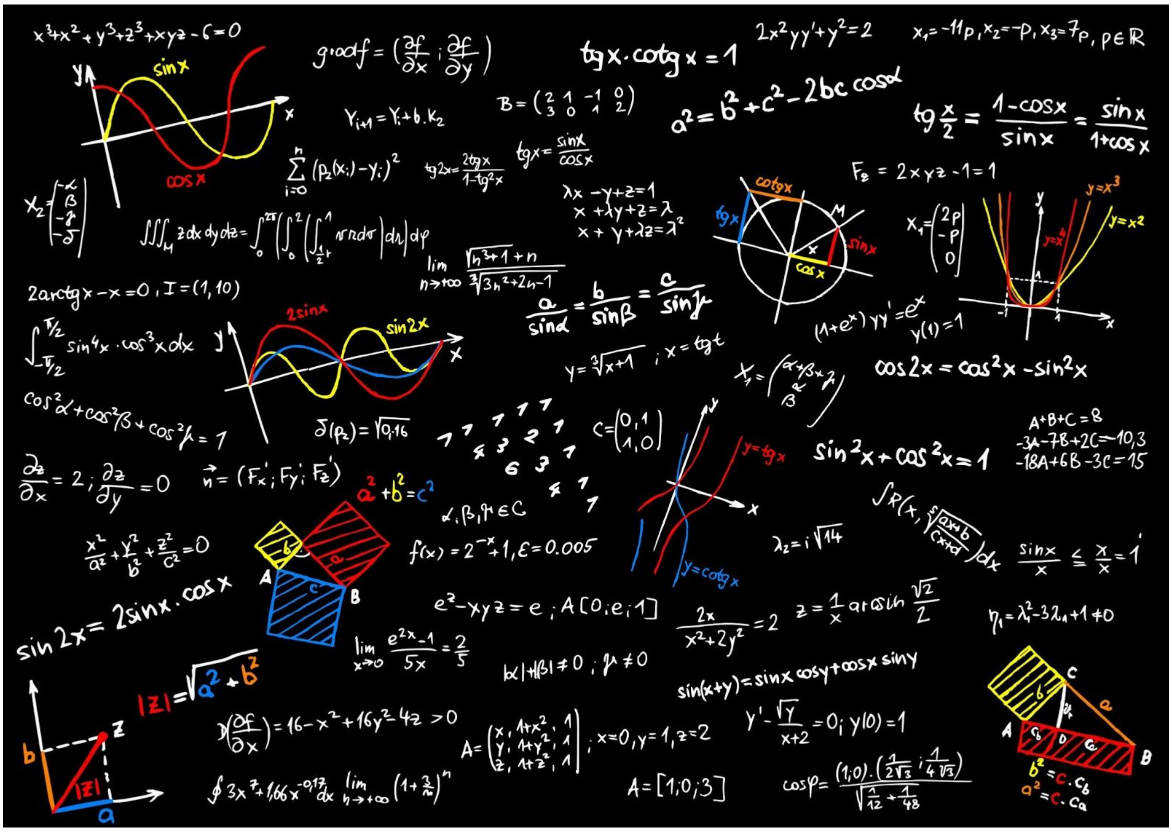
CALCULUS 1: 2nd Partial Proyect



APPLICATIONS OF MOTION: POSITION, VELOCITY AND ACCELERATION

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CALCULUS I

2nd Partial Project

APPLICATIONS OF MOTION: POSITION, VELOCITY AND ACCELERATION

Introduction: One of the main competencies to develop throughout this course is to represent data from real life situations in a mathematical way using tables, graphs, diagrams and/or equations. In this project you will use what you have learned to model situations using graphs and equations.

1) You will work in teams of no more than four students to solve the tasks involved in this project. Remember that working with a team implies that everyone in the team cooperates to find the best solution and it does not mean to split the work in parts that when presented on the project do not seem to belong together.

2) It is also important to remember that every report should start with an **introduction** where you introduce the topic (**MOTION: POSITION, VELOCITY AND ACCELERATION**) and you give an idea of the approach and goal(s) of the investigation. Do not forget to include your references for this section because that will be graded.

3) The final version of your report must be written in a clear and comprehensible form and it should show the steps (pictures) you followed to solve the situation(s), including procedures, explanations and/or justifications needed, and the results of your investigation, where everything, the process and the results, are completely clear for the reader.

4) The Project will be uploaded in your Portfolio (Geogebra Book).

5) The due date is Tuesday, October, 10th, 2017 before 11:59 pm

PROJECT

6) Consider only **the table that your teacher will assign to your team.**

7) For each of the functions on the table (,,,, ,) build a graph (you can get the graph by using graphmatica with the option Data Plot Editor or any other software). You have to include 6 different graphs (scatter plot).

8) Analyze the behavior of each graph and define the type of function that belongs to each one, justify your choices clearly according to the pattern on the graph and main characteristics of the function that you are choosing.

9) Use the information (values) from the table of position to establish the specific **equation of Position** that matches each one.

10) Using the equation of position that you found previously for each graph, find the **equation of velocity** and the **equation of acceleration** for each graph. Remember to include your procedures.

GENERAL INFORMATION

11) Make sure to deliver your project using your Portfolio (Geogebra Book).

12) Your final report must include cover page, bibliography and final conclusions of each member of the team. The bibliography must include at least one source and should be written using the APA format.

13) Remember that it is very important to include procedures, all of the graphs that were required and any additional graphs that will help you clarify or explain your work, the graphs should include all the details (such as scale, labels, units, etc.) as well as all the explanations and justifications necessary to make your work clear to the reader.

14) The students should be able to:

Know and apply the right mathematical notation and terminology.

Organize and represent the information using tables, graphs and diagrams.

Recognize models and structures in different situations and make generalizations.

Show understanding and knowledge of the mathematical models and use them appropriately.

Recognize the practical applications of mathematics and show full understanding.

Use technological devices as mathematical tools that will contribute to the solution of the given situation.

15) Throughout the project it should be evident that the students:

Have full understanding about the parent functions and the effect (transformations on the graph) that the different parameters have.

Are able to analyze graphs of different functions, recognize the main elements for each and be able to determine the kind of function that belongs to a certain graph.

Are able to analyze certain situation and establish the function that models the situation.

Communicate mathematical ideas in a clear and effective way using the right notation and terminology.

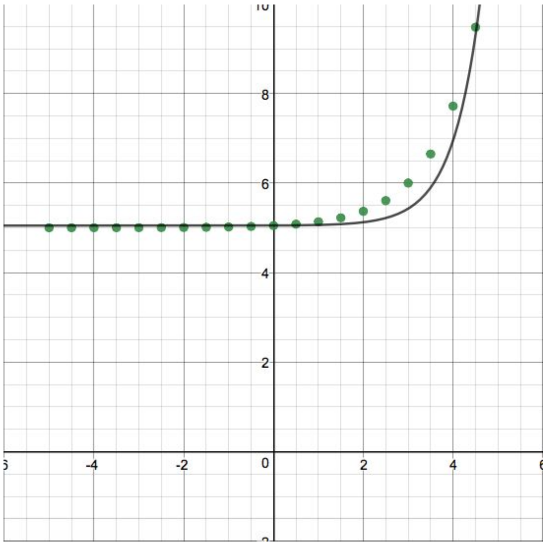
Have developed the ability to work in an honest and responsible form, with high quality, within a team and favoring his/her personal development.

Make sure that you **check the rubrics "Rubric: 2nd partial project"** that would be used to grade this project. The grade that you get by using this rubric will be multiplied by 4 (four) to get your grade in a 100 scale.

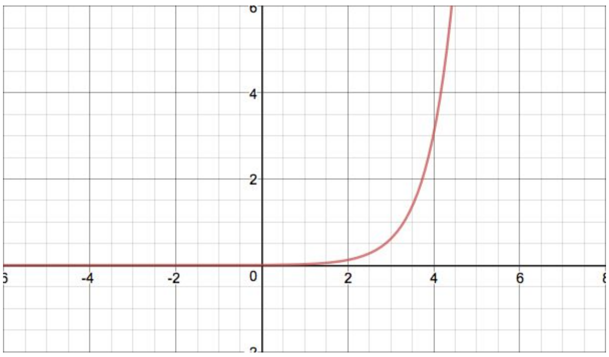
Introduction

Motion can be described as the action of changing location and position. The study of this branch of mechanics without considering any forces is called kinematics. This area describes the spatial position of bodies, the rate at which the bodies are moving, which is called velocity, and the rate at which the velocity is changing, known as acceleration. If we have a formula that can describe the position of the object we can find the rate at which the velocity is changing, and by knowing the formula of velocity we can find the rate at which the acceleration is changing by taking on the derivative of the given equation. Taking in consideration the concepts mentioned before, we'll find the equations of velocity and acceleration from the functions describing the position of the object.

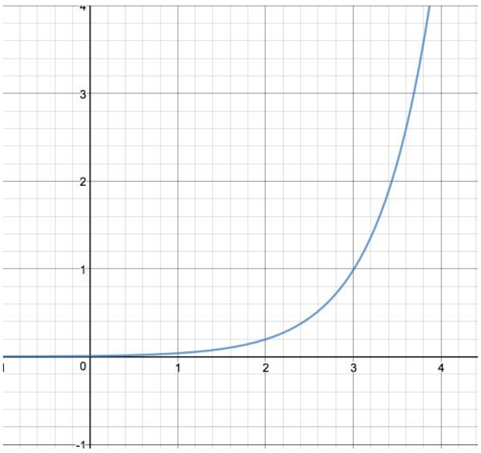
f(t)= $5^{(x-3.6)}+5.05$



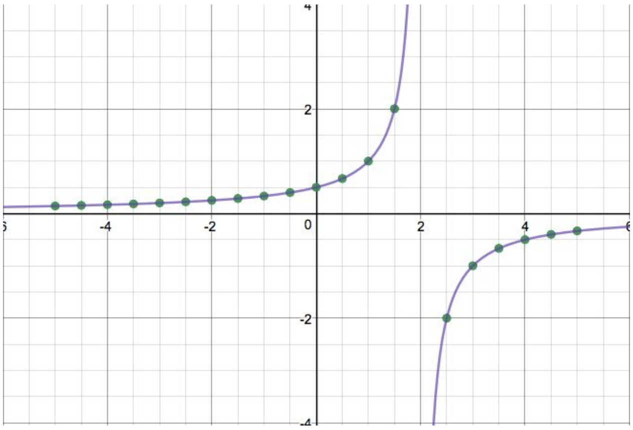
v(t)= $5^{(x-3.6)}(ln(5))$



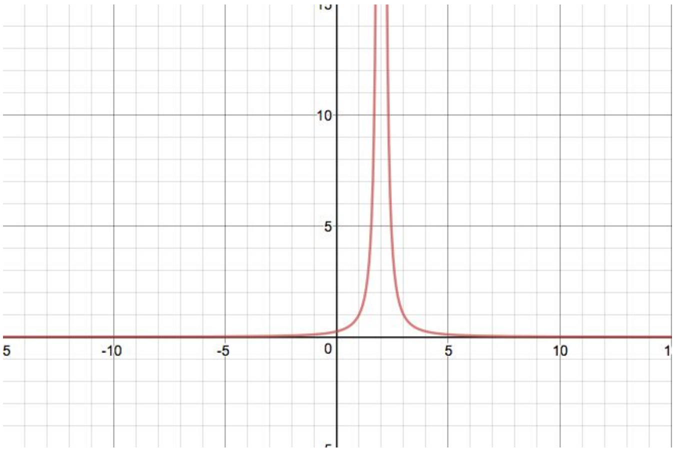
a(t)= $5^{(x-3.6)}(ln^{2}(5))$



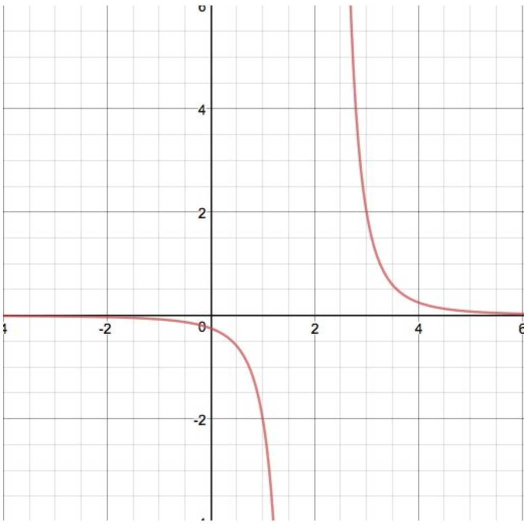
$g(t) = \frac{-1}{x-2}$ = -1 $(x-2)^{-2}$



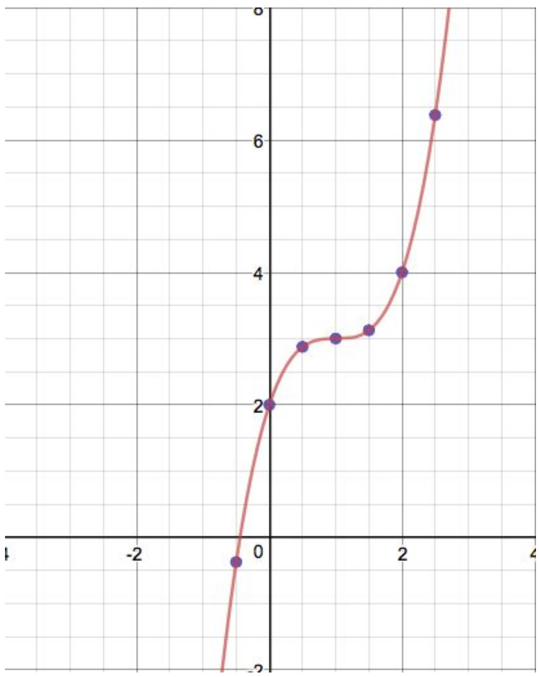
$v(t) = \frac{1}{(x-2)^2}$

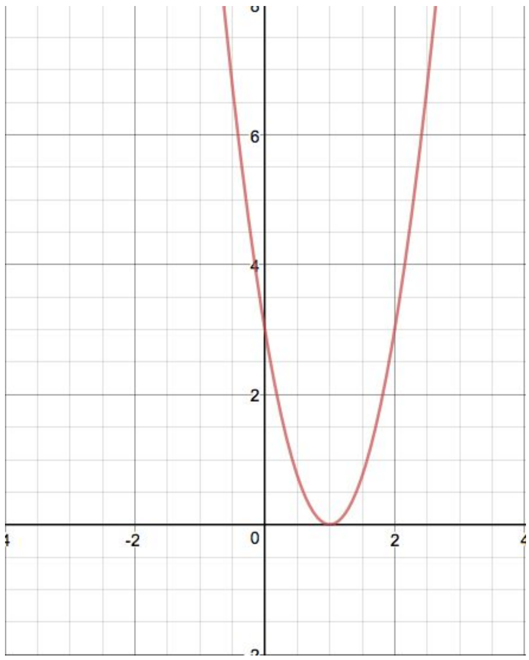


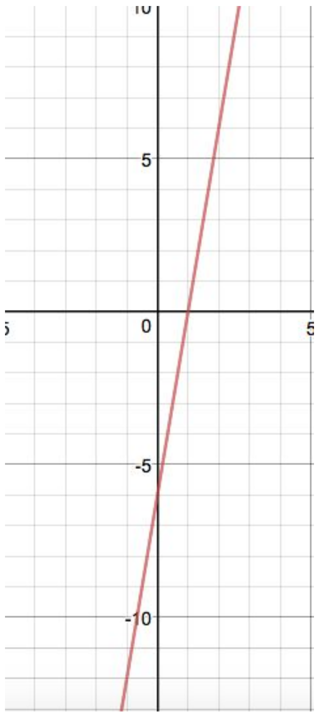
$a(t) = \frac{2}{(x-2)^3}$ = -2 $(x-2)^{-3}$



h(t)= $(x-1)^3+3$







$v(t) = 3(x-1)^2$ = $3(x-1)^2(1)$

a(t)=6(x-1)

$F(t)= |x+1|-2$

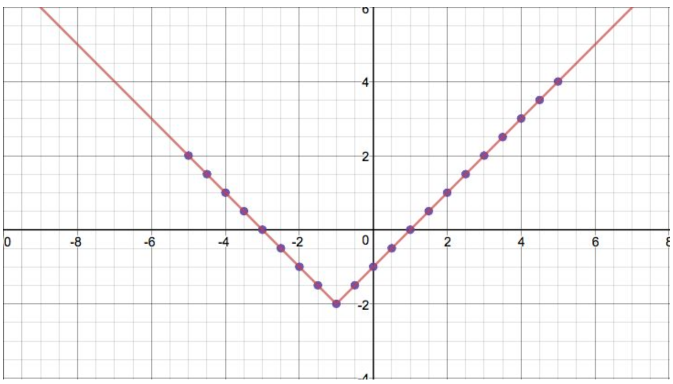
(5,4) (4.5,3.5)

$m = \frac{4-3.5}{5-4.5} = \frac{-5}{-5} = 1$

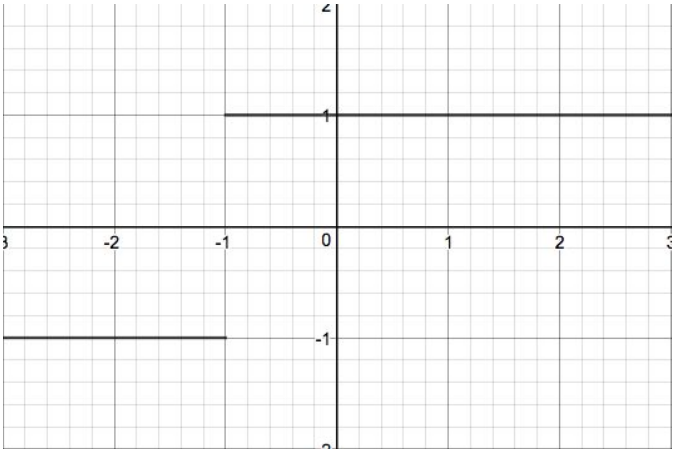
$4 = 1(5) + b$

$-1 = b$

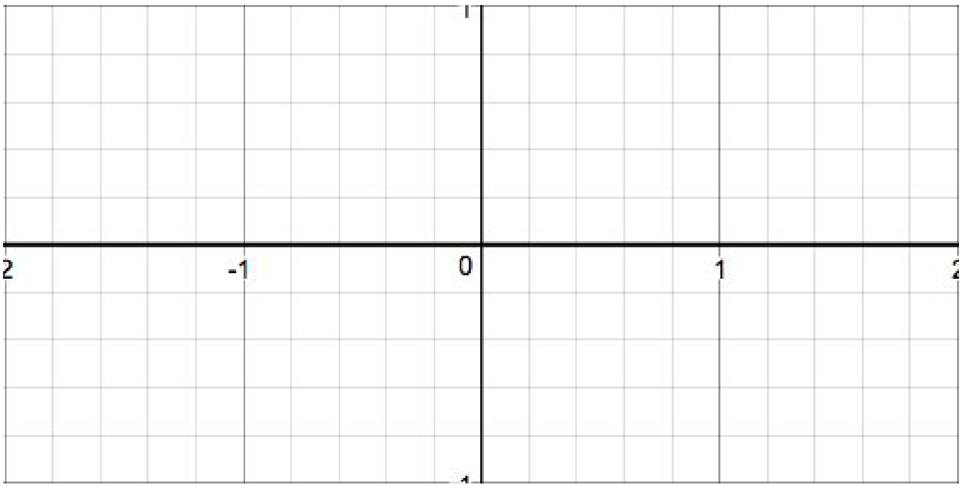
y= $|x+1|$ -2



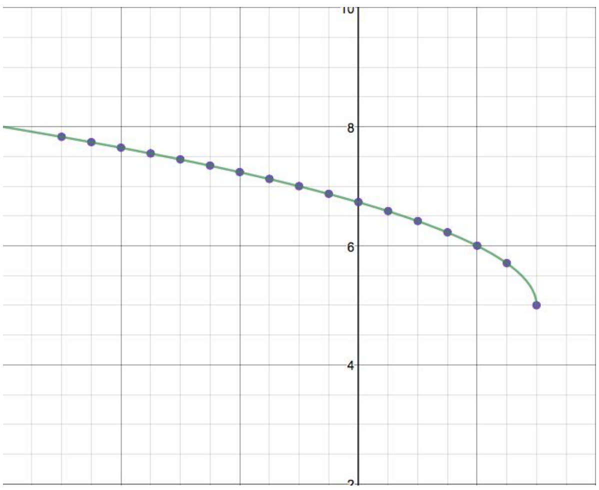
$v(t)= \frac{(x+1)}{|x+1|}$ = $\frac{|x+1|-(x+1)(\frac{x+1}{|x+1|})}{|x+1|}$



a(t)= 0

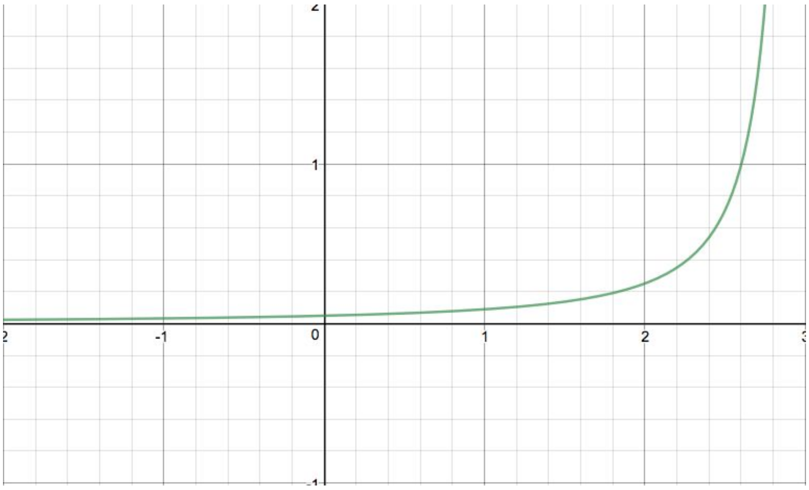


G(t)= $\sqrt{(3-x)}$ +5

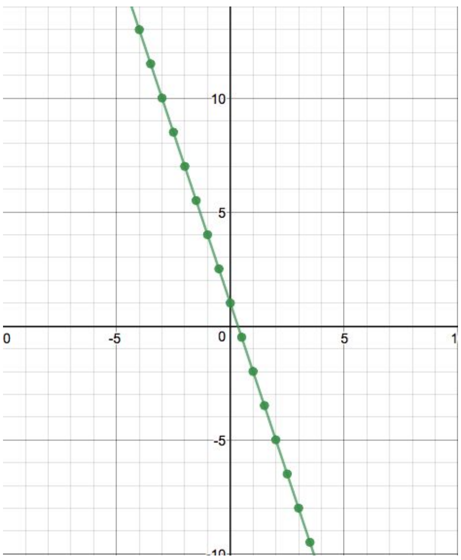


v(t)= $-\frac{(3-x)^{-1/2}}{2}$ = $(-x+3)^{1/2} = \frac{1}{2}$ (-x+3)(-1)

$a(t)=-\frac{(3-x)^{-3/2}}{4} = \frac{-(-x+3)}{2} = -\frac{1}{2}(-x+3)^{-1/2} = \frac{-(-x+3)^{-3/2}}{4}$

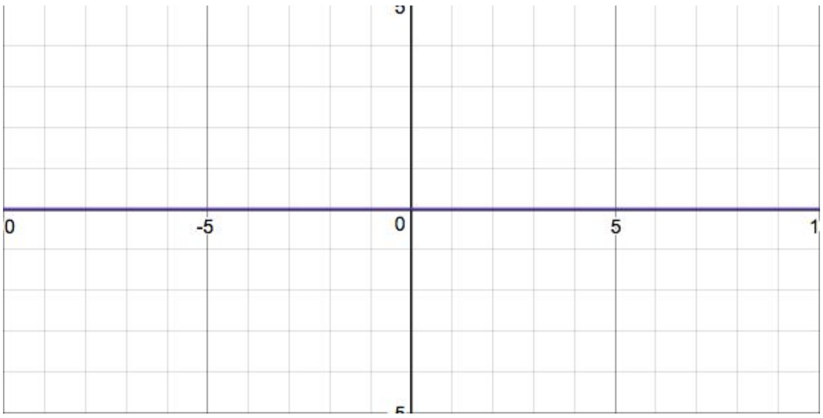


$H(t)= -3x+1$



$v(t)=-3$

a(t)=0



By knowing how to take the derivative from the functions, it is quite easy to find an equation that gives you the rate of change of something. A perfect example as shown above is the application of derivatives in motion, thereby having the formula of position, is possible to find the function for velocity and acceleration for the given formula.

By locating and applying the different types of derivative rules that we learned in class, it was easier to determine what formula to use in its respective case and saved us a lot of time. Also, we realized that thanks to our previous knowledge of the types of graph functions from past semesters, we easily knew what function we were trying to find just by looking at the shape and tendency of it.

References:

The Editors of Encyclopædia Britannica. (2017, June 21). Kinematics. Retrieved October 10, 2017, from https://www.britannica.com/science/kinematics

Elert, G. (n.d.). Motion. Retrieved October 10, 2017, from https://physics.info/motion/