APPLICATIONS OF

MOTION: POSITION VELOCITY AND ACCELERATION

2nd Partial Project

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Introduction

For this project, we are going to need to apply every previous knowledge on the development of the equations, like graphs. For getting each equation, are going to plot all the points in the graph and determine the most exact equation for each one. Given that equation of position, we are going to find the derivative in order to find the equation of velocity and also for the equation of acceleration.

In order to achieve the project's goal we need to know what velocity and acceleration is. Velocity is defined as a change in position in a given amount of time, to calculate it we can use the formula: velocity equals change in position over change in time. Acceleration is defined by the change of velocity in a given amount of time, to calculate it we can use the formula: acceleration equals change in velocity over the change in time.

We're projecting our graphs in this document and placing our data. The object of this project would be for us to learn how to classify graphs by getting their function and the functions for velocity and accelerations getting the derivatives, which we have been studying during this partial.

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Graph f(t)

$f(t)$: $\frac{1}{x} + 1$

This graph represents a positive rational function and it has a vertical asymptote at x=0 and a horizontal asymptote at y=1. The domain of the graph is "all real numbers" and the range goes from [-1,3].

In order to obtain the equation of velocity we derived the original equation and we obtained:

Velocity $v(t)$: $1x^{-1} + 1$

Velocity $v'(t)$: $1(-1)x^{-1+(-1)} + 1$

Velocity $v'(t)$: $-1x^{-2}$

Velocity $v'(t)$: $-\frac{1}{x^2}$

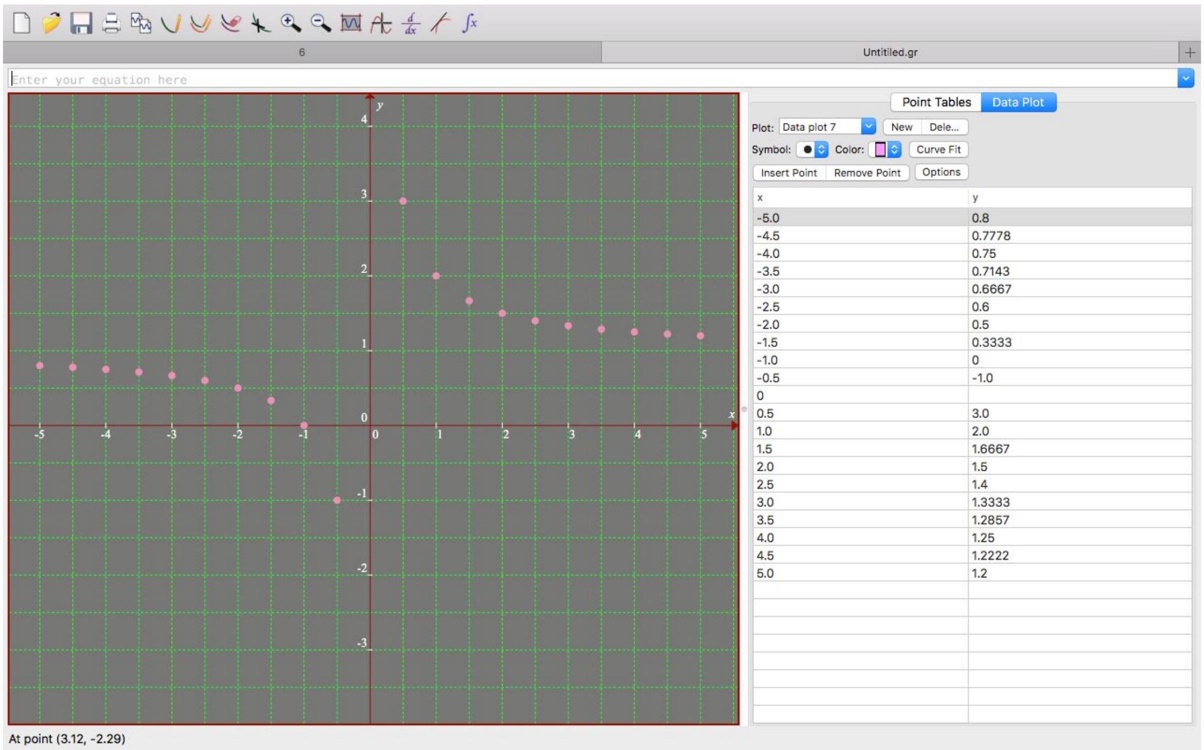
And to obtain the acceleration of the equation of position we derived the equation of velocity, where we obtained:

Acceleration $a(t)$: $-1x^{-2}$

Acceleration $a'(t)$: $-1(-2)x^{-2+(-1)}$

Acceleration $a'(t)$: $2x^{-3}$

Acceleration $a'(t)$: $\frac{2}{x^3}$



Graph g(t)

g(t): $\sqrt{x}$

The graph represents a positive radical function. The domain of the graph is [0,5] and the range goes from [0,2.25].

In order to obtain the function of velocity we derived the original function and we obtained:

Velocity g(t): $(x)^{\frac{1}{2}}$

Velocity g'(t): $\frac{1}{2}(x)^{\frac{1}{2}-1}$

Velocity g'(t): $\frac{1}{2}(x)^{-\frac{1}{2}}$

Velocity g'(t): $\frac{1}{2\sqrt{x}}$

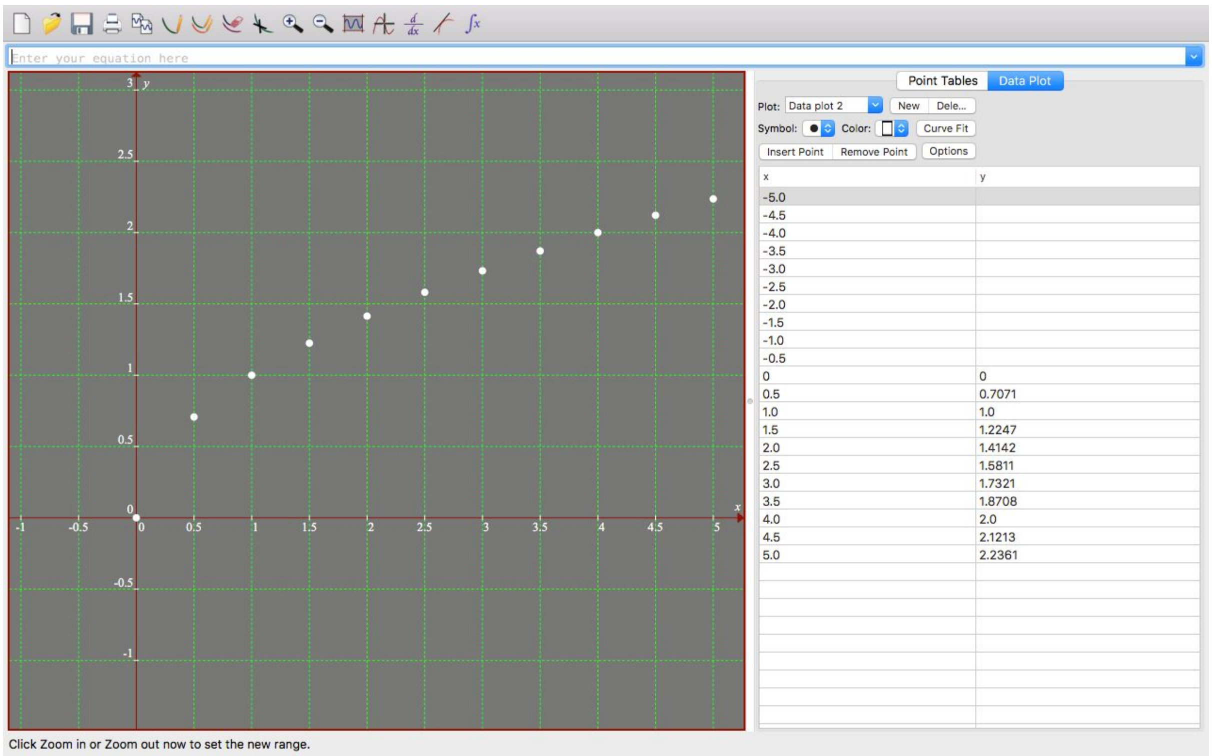
And to obtain the acceleration of the function of position we derived the function of velocity, where we obtained:

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

Acceleration g'(t): $\frac{1}{2}(\frac{1}{2})(x)^{-\frac{1}{2}-1}$

Acceleration g'(t): $\frac{1}{4}(x)^{-\frac{3}{2}}$

Acceleration g'(t): $-\frac{1}{4\sqrt{x^3}}$



Graph h(t)

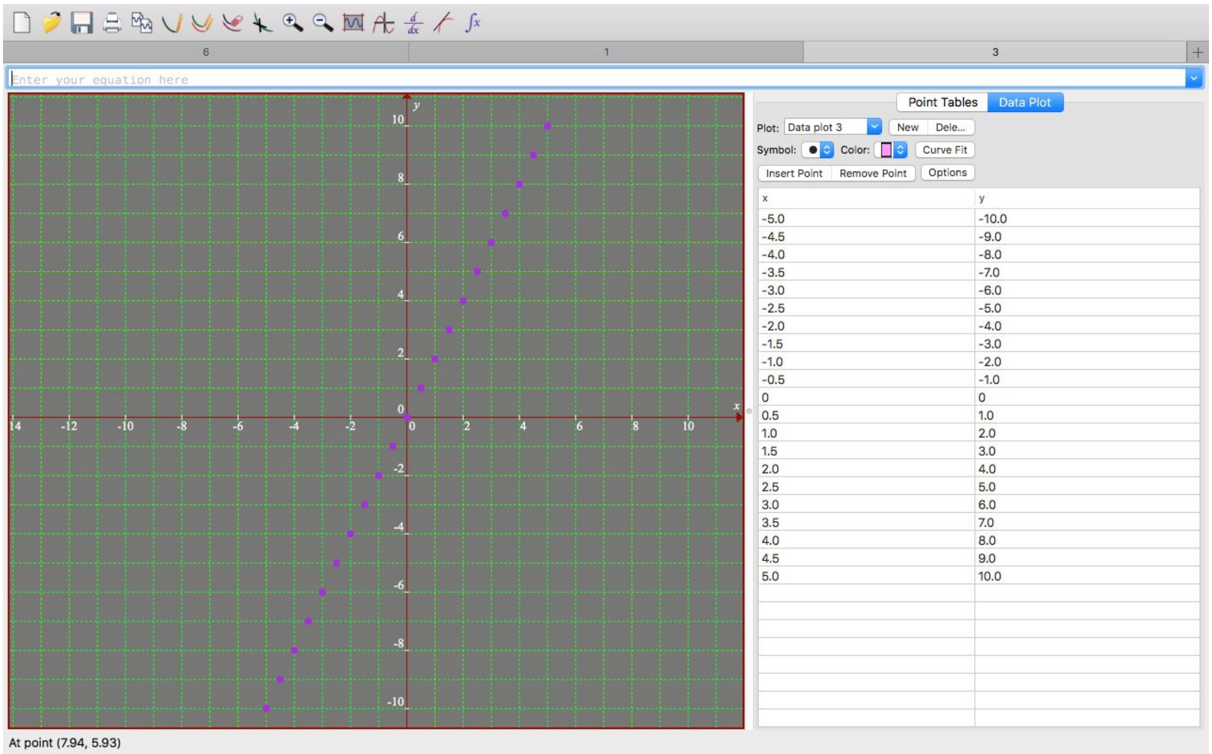
h(t)=2x

The graph is a positive linear function. It has a domain of [5,-5] and a range of [10, -10]

In order to obtain the equation of velocity we derived the original function and we obtained:

Velocity of v(t)=2

And to obtain the acceleration of the function of position we derived the equation of velocity, where we obtained **0** because you can not do anything else to the equation of velocity.



Graph F(t)

f(t): $\sqrt{x+2.3}-1.5$

This graph represents a positive radical function. The domain of the graph is [-2.5,5] and the range goes from [-1.69,1.07]. The graph presents a vertical shift of 1.5 units downwards and a horizontal shift of 2.3 to the left.

In order to obtain the equation of velocity we derived the original equation and we obtained:

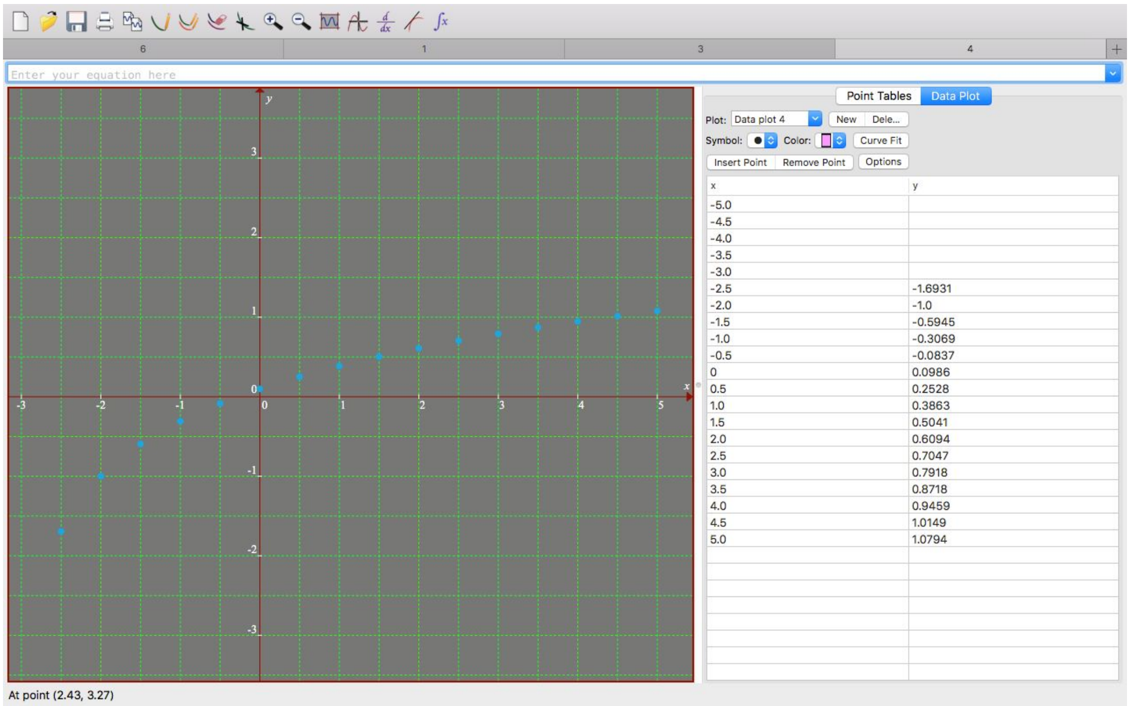
Velocity v(t): $1/2(x+2.3)^{-1/2}(1)$

Velocity v'(t): $\frac{1}{2\sqrt{x+2.3}}$

And to obtain the acceleration of the equation of position we derived the equation of velocity, where we obtained:

Acceleration a(t): $\frac{-1/2(x+2.3)^{-1/2-1}}{2}$

Acceleration a'(t): $\frac{-1}{4\sqrt{(x+2.3)^{3}}}$



x	y
-5.0	
-4.5	
-4.0	
-3.5	
-3.0	
-2.5	-1.6931
-2.0	-1.0
-1.5	-0.5945
-1.0	-0.3069
-0.5	-0.0837
0	0.0986
0.5	0.2528
1.0	0.3863
1.5	0.5041
2.0	0.6094
2.5	0.7047
3.0	0.7918
3.5	0.8718
4.0	0.9459
4.5	1.0149
5.0	1.0794

Graph G(t)

g(t)= 1/2(x-2)2 +1 ; {x > 5}

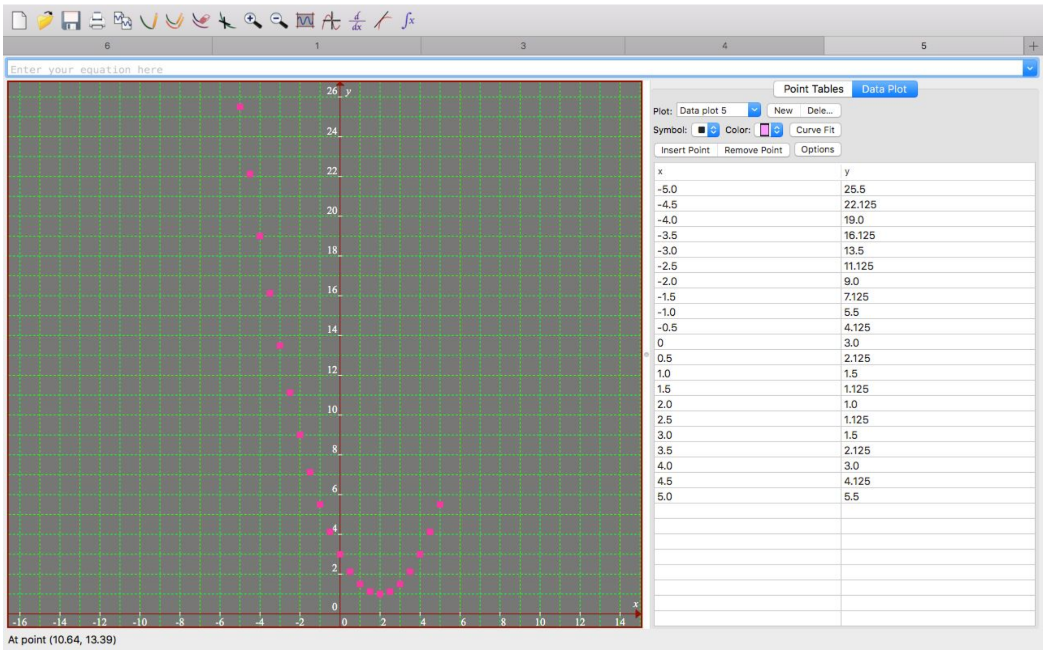
This graphs shows a parabola, with a domain of (-1.5, 5), and a range of (1, 7.12). It has a discontinuity at x=5. The graph is a positive function. It has a vertical shift of 1 unit upward and a horizontal shift of 2 units to the right.

In order to obtain the equation of velocity we derived the original equation and we obtained:

Velocity v'(t)= 1/2(x-2)2 +1
Velocity v'(t)= ½ (2)(x-2)2-1
Velocity v'(t)= x-2

And to obtain the acceleration of the function of position we derived the function of velocity, where we obtained:

Acceleration a(t)= x-2
Acceleration a'(t)= 1



Graph H(t)

$H(t)=|x+2|-3$; $x < -5$

The graph is a positive absolute value function. It's domain would be [-5, 5] , and the range [-3, 4].

In order to obtain the equation of velocity we derived the original function and we obtained:

Velocity $v(t)=|x+2|-3$

$u=|x|$ $v=x+2$

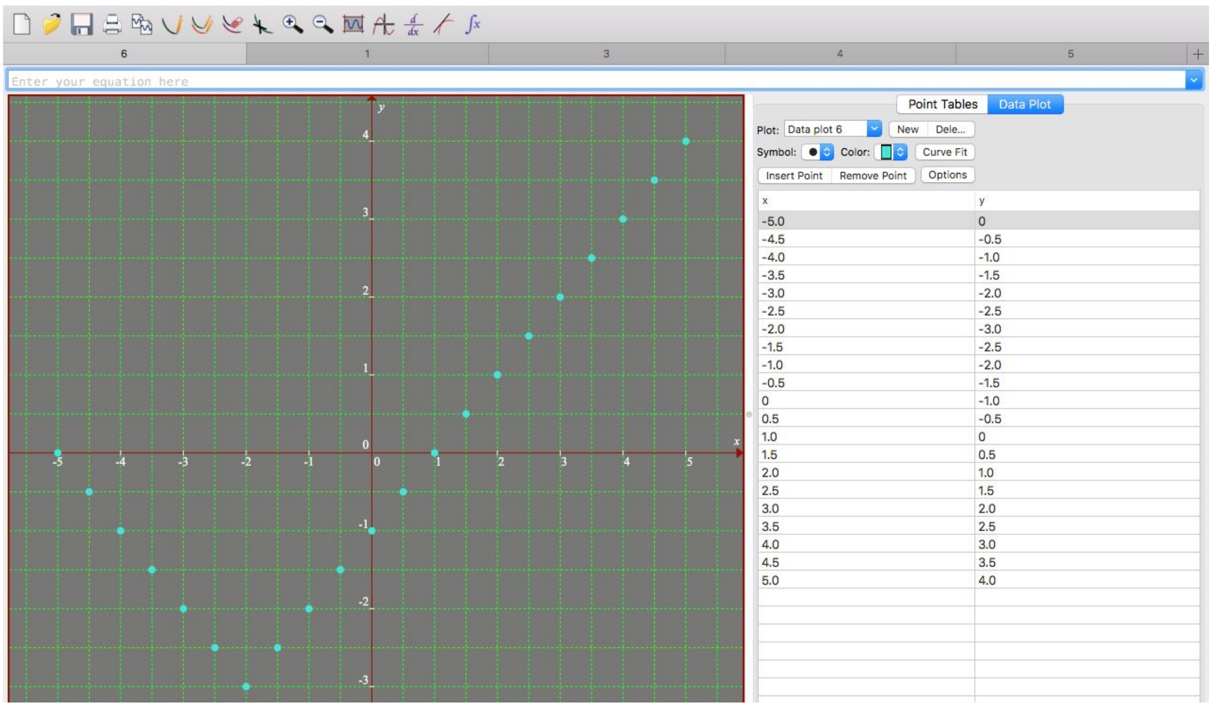
$u'=x\frac{x}{|x|}$ $v'=1$

Velocity $v'(t)=\frac{x+2}{|x+2|}$

And to obtain the acceleration of the function of position we derived the function of velocity, where we obtained:

Acceleration $a(t)=\frac{(|x+2|)(1)-(x-2)\frac{x+2}{|x+2|}}{|x+2|^{2}}$

Acceleration $a(t)=\frac{|x+2|-x+2(\frac{x+2}{|x+2|})}{|x+2|^{2}}$



x	y
-5.0	0
-4.5	-0.5
-4.0	-1.0
-3.5	-1.5
-3.0	-2.0
-2.5	-2.5
-2.0	-3.0
-1.5	-2.5
-1.0	-2.0
-0.5	-1.5
0	-1.0
0.5	-0.5
1.0	0
1.5	0.5
2.0	1.0
2.5	1.5
3.0	2.0
3.5	2.5
4.0	3.0
4.5	3.5
5.0	4.0

Individual conclusions:

Barbara: This project helped me with two main subjects: graphs and derivatives. While trying to find a function for the graph, I remembered all the types of graphs we learned and tried to get the function of position. By finding that I was able to the get derivative and with that the function of velocity and the same with the function of acceleration.

Sofia: In this project, with the help of my teammates, I started getting a clearer view of how derivatives work, and I really hope it could help me with future math projects and activities. For me velocity and acceleration are still difficult topics, but I'm getting there.

Karen: This project helped me a lot to practice derivatives and graphing functions. We graphed the data that was provided to us and then found the function that belonged to the graph, found the derivative and finally described its behavior. Thanks to this graph I could reinforce what i've learned through the semester and will help a lot in the future.

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