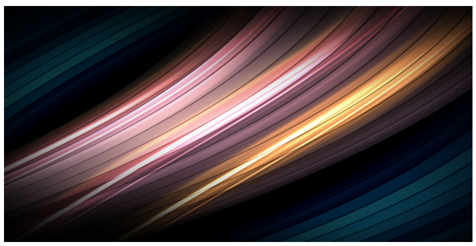
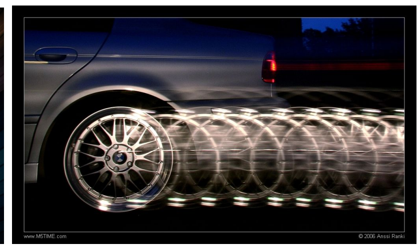
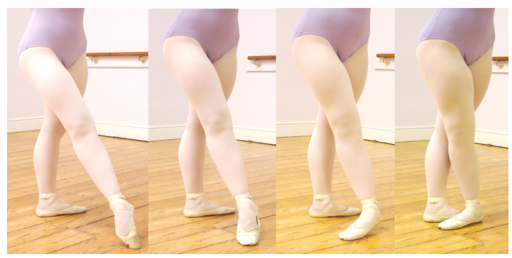
INSTITUTO TECNOLÓGICO DE ESTUDIOS SUPERIORES DE MONTERREY

PREPA TEC



CALCULUS I

2nd Partial Project

APPLICATIONS OF MOTION: POSITION, VELOCITY AND ACCELERATION.

Hannia Larissa Gómez Wolfskill A01570193
Brenda Nallely Cantú Lozano A01570225
Mariana González Villarreal A01570247

★ Introduction // Motion: Position, Velocity and Acceleration

Motion is defined as the change or the process of changing the position or location of an object.
To describe a motion it is essential to specify the position of the object, which is a set of coordinates that are used to specify the location of the object. Motion can be described in terms of velocity and acceleration. Velocity is the vector measurement of the magnitude and the direction of the change in the position of an object over the time the change takes. In calculus, velocity is the first derivative of position in consideration of the time. Acceleration is the vector measurement that indicates the change of velocity over a period of time. In calculus, acceleration is the second derivative of position in consideration of the time, and the derivative of velocity.
The goal of the investigation we want to approach is to have a better understanding of the topic. Also, we can use further use of the elements learned about derivatives in other situations, such as in physics in the topic of mechanics.

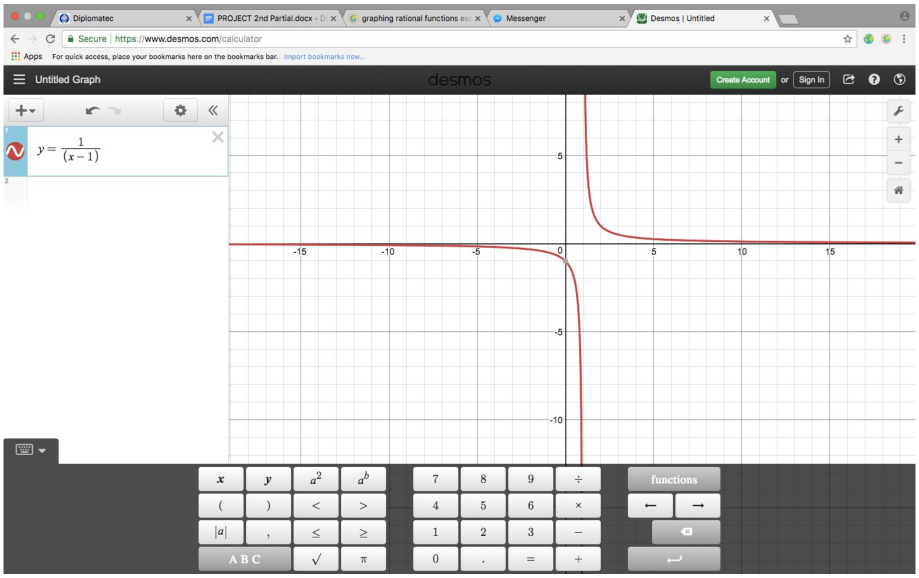
CALCULUS I
TABLE OF POSITION

TABLE “A”

t	f(t)	g(t)	h(t)	F(t)	G(t)	H(t)
-5	-0.16667	1	-5	N.P.	4	-0.99909
-4.5	-0.18182	-1.75	-4	N.P.	3.5	-0.9985
-4	-0.2	-4	-3	N.P.	3	-0.99752
-3.5	-0.22222	-5.75	-2	N.P.	2.5	-0.99591
-3	-0.25	-7	-1	N.P.	2	-0.99326
-2.5	-0.28571	-7.75	0	N.P.	1.5	-0.98889
-2	-0.33333	-8	1	1	1	-0.98168
-1.5	-0.4	-7.75	2	1.707107	0.5	-0.9698
-1	-0.5	-7	3	2	0	-0.95021
-0.5	-0.66667	-5.75	4	2.224745	-0.5	-0.91792
0	-1	-4	5	2.414214	-1	-0.86466

0.5	-2	-1.75	6	2.581139	-1.5	-0.77687
1	N.P.	1	7	2.732051	-2	-0.63212
1.5	2	4.25	8	2.870829	-2.5	-0.39347
2	1	8	9	3	-3	0
2.5	0.666667	12.25	10	3.12132	-2.5	0.648721
3	0.5	17	11	3.236068	-2	1.718282
3.5	0.4	22.25	12	3.345208	-1.5	3.481689
4	0.333333	28	13	3.44949	-1	6.389056
4.5	0.285714	34.25	14	3.54951	-0.5	11.18249
5	0.25	41	15	3.645751	0	19.08554

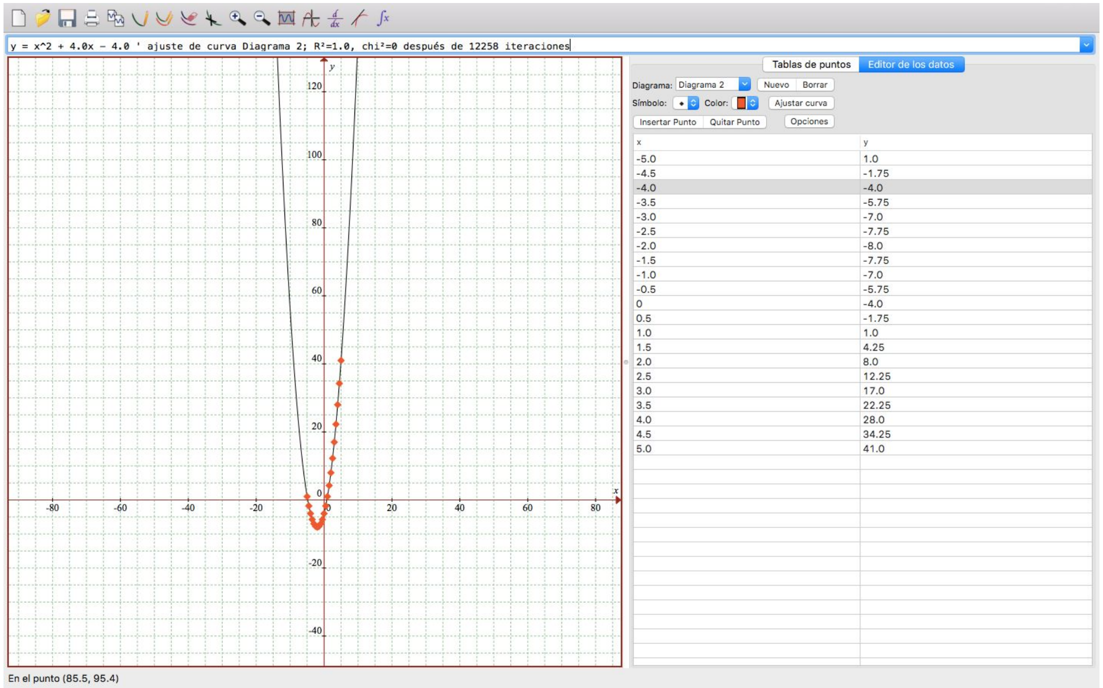
GRAPHS



1)

f(t):

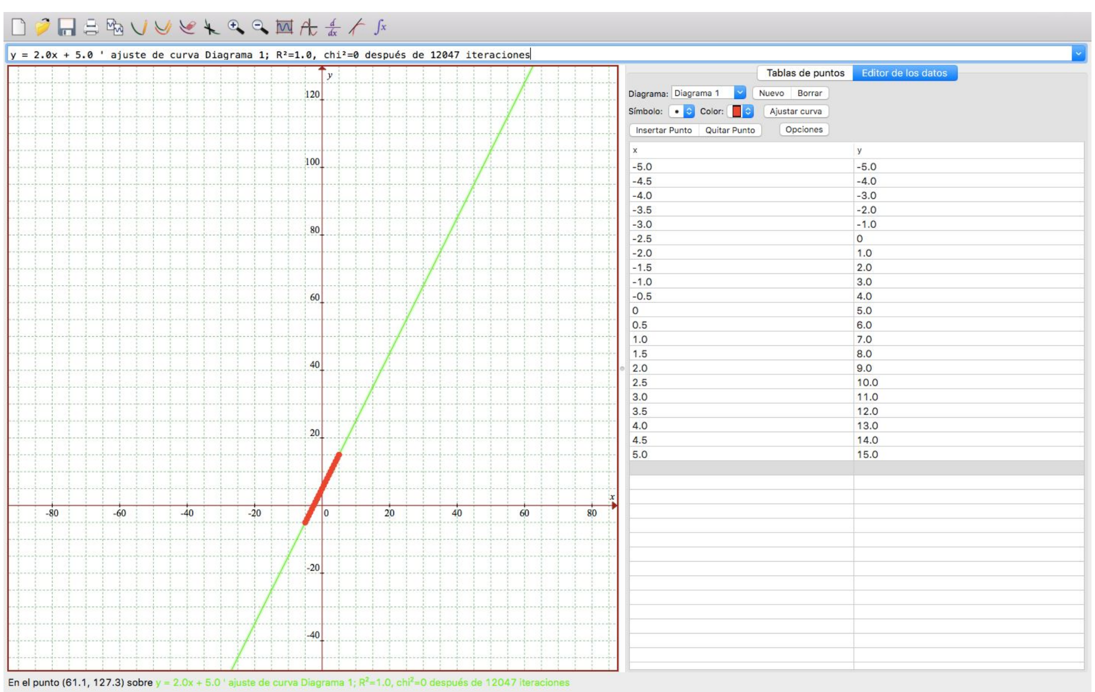
- ➔ Type:
    - ◆ Rational function.
- ➔ Justification: Based on the look of the graph, we can determine that the graph is from a rational function. Using the rules of chain and quotient mainly, we solved for the derivative of this equation.
- ➔ Main characteristics of the function:
    - ◆ Have Holes, Vertical Asymptotes, Horizontal Asymptotes
    - ◆ Domain is all real numbers
    - ◆ The rate of change is not continuous.
- ➔ Equation of position: f(x)= 1/(x-1)
- ➔ Equation of velocity: f'(x)= -1 / (x-1)^2
- ➔ Equation of acceleration: f''(x)= 2/(x-1)^3



2)

g(t):

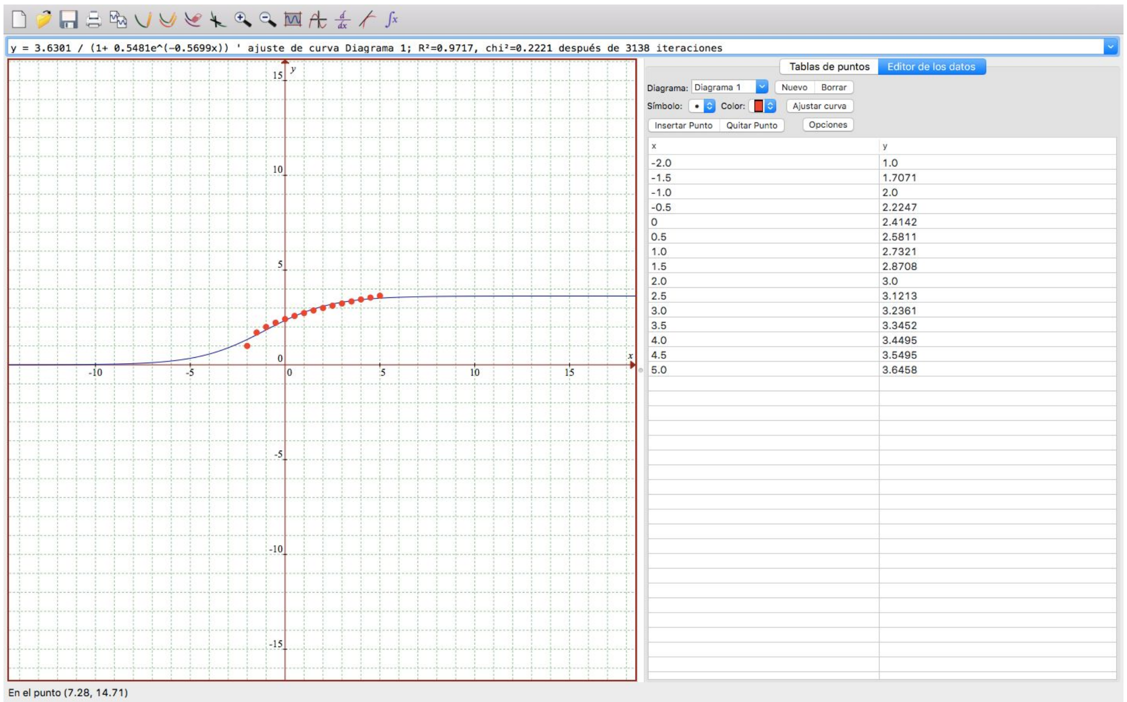
- Type:
  - Parabola function
- Justification:
  - By the form of U of the graph, we can determine that is a parabola function. Using the rules of power, and derivate of a constant we obtained the results for the derivative.
- Main characteristics of the function:
  - If the parabola is positive, it will open up, if negative, down.
  - Point at what the parabola intersects located in the x-axis.
  - Vertex of the parabola is the highest point.
- Equation of position: g(t)= x^2 + 4x - 4
- Equation of velocity: g´(t)= 2x + 4
- Equation of acceleration: g´´(t)=2



3)

h(t):

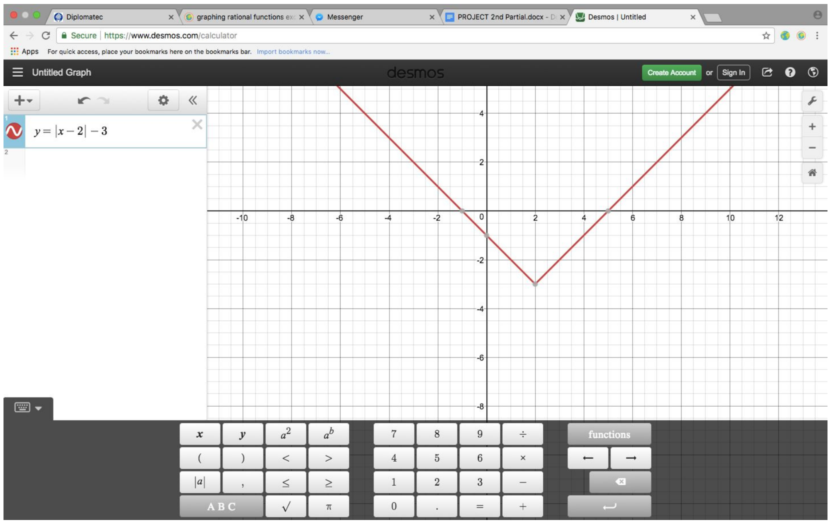
- Type:
  - Linear function
- Justification:
  - We determined that this graph is linear, by its form of a line. Using the rule of the derivative of a constant, we get the derivatives of the equation given.
- Main characteristics of the function:
  - Simple and easy to handle mathematically
  - Has one dependent and independent variable.
  - Function popular in economics.
- Equation of position: h(t)= 2x + 5
- Equation of velocity: h'(t)= 2
- Equation of acceleration: h''(t)= 0 there isn't a derivative



4)

F(t):

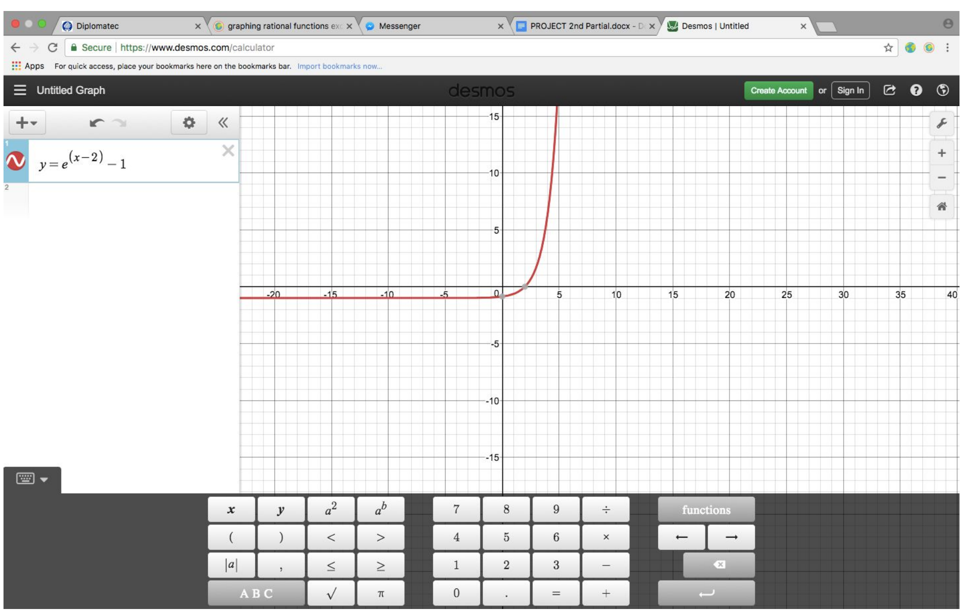
- Type:
  - Square root function
- Justification:
  - We chose this type of function because the table gives an origin and because of the values increasing in that way, it creates the form that this function is known for. Using the power rule and chain rule mainly, we obtained the equations needed.
- Main characteristics of the function:
  - Negative values in the square root function are excluded.
  - The function starts in the origin increasing the values of the axis.
  - The number zero it can be included in the range.
- Equation of position: F(t)= (x-2)^½ +1
- Equation of velocity: F'(t)= 1/ 2(x-2)^½ +1
- Equation of acceleration: F''(x)= -0.5 / 2(x-2)^3/2 +1



5)

G(t):

- ➔ Type:
  - ◆ Absolute value function
- ➔ Justification:
  - ◆ We say this is an absolute value function because this type of function always center into a point and spreads, looking like a “v”. USing the rules for getting the derivative of a equation of quotient and chain rule mainly we obtained the equations needed.
- ➔ Main characteristics of the function:
  - ◆ Use to measure the distance between two numbers.
  - ◆ Is continuous everywhere
  - ◆ Is not an invertible function.
- ➔ Equation of position: G(t)= lx-2l -3
- ➔ Equation of velocity: G’(t)= t-2 / | t-2 |
- ➔ Equation of acceleration: g’’(t)= | t-2 | -(t-2)(t-2/ | t-2 |) / | t-2 | ^2



6)

H(t):

- Type:
  - Exponential function
- Justification:
  - We determined that this graph is an exponential one, because it starts with negative values of x and then it starts climbing to positive x's. Using the properties of logarithms, we obtained the equations for the position, velocity and acceleration.
- Main characteristics of the function:
  - Graph never touches the x-axis.
  - Graph can describe growth or decay.
  - Domain is all real numbers.
- Equation of position: H(t)= e^(x-2) -1
- Equation of velocity: H'(t)= e^(x-2) -1
- Equation of acceleration: H''(t)= e^(x-2) -1

CONCLUSIONS:

★ **Mariana**

I can conclude, that knowing how to derivate is important because if we know the equation of position we can easily get the velocity and acceleration. Is very useful for describing and analyzing the motion of an object.

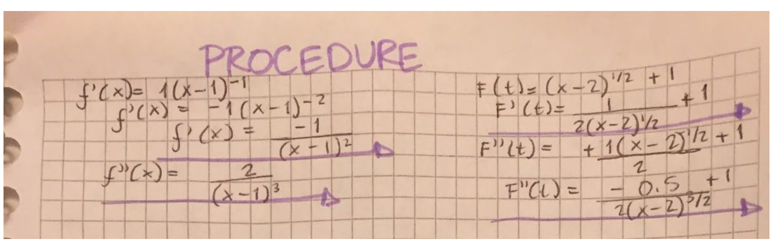
★ **Hannia**

I came to a conclusion that if you are able to know what type of function is and the way to make an equation out of a graph or table of values you can find information easily, like the equations of velocity and acceleration and it is useful for analyzing information of a problem.

★ **Brenda**

Derivatives are an interesting topic to learn, because whether or not, you will be using them at some point of your life. That's what mathematics is about. To be honest, this topic is confusing, but nothing impossible. When you finally understand what you are doing, the rest is easy. Practice is our best ally.

PROCEDURE:



BIBLIOGRAPHY:

- **Mathspace. Identify Characteristics of Square Root Functions. *Mathspace.* Retrieved: Oct. 09, 2017. Link: https://mathspace.co/learn/world-of-maths/graphing-other-functions/identify-characteristics-of-square-root-functions-67441/characteristics-1406/**
- **What is motion in physics? (n.d.). Retrieved October 09, 2017, from https://www.reference.com/science/motion-physics-6562a789c54084d6#**
- **What is POSITION? definition of POSITION (Science Dictionary). (2013, September 14). Retrieved October 09, 2017, from http://thesciencedictionary.org/position/**

- **Position. (n.d.). Retrieved October 09, 2017, from http://hyperphysics.phy-astr.gsu.edu/hbase/posit.html**
- **Jones, A. Z. (n.d.). What Velocity Means and How To Calculate It. Retrieved October 09, 2017, from https://www.thoughtco.com/velocity-definition-in-physics-2699021**
- **Jones, A. Z. (n.d.). What Is the Definition of Acceleration? Retrieved October 09, 2017, from https://www.thoughtco.com/acceleration-2698960**
- **Description of Motion in One Dimension. (n.d.). Retrieved October 09, 2017, from http://hyperphysics.phy-astr.gsu.edu/hbase/mot.html#mot1**