

Inclined Rail Lab - Extension Activity Unit III
Casio Graphing Calculator

Introduction: In the Inclined Rail Lab, you obtained a general mathematical model of: $x=kt^2$. The term “k” represented the slope of the linearized graph of Position vs. Time. We will use the Casio Graphing Calculator to further analyze the data collected in this extension activity of the lab. By following the steps below, you will be able to find the instantaneous velocity of your object on the rail. You will also be able to develop a graphical relationship and mathematical model for velocity vs. time.

Casio Instructions: (CFX9850Ga PLUS)

1. Turn on calculator.
2. Hit 5 GRAPH
3. Make sure your graph function is set to “Y=”
4. In Y1 enter your math model from the lab including your slope.
(Example: Y1: $0.403X^2$.)
5. Set your graph window to best view the graph. The setting for X and Y should reflect the max and min range from your lab data. You may have to repeat this step until you get the best view of your graph on the screen. You will want to parabola shifted up slightly on the screen to leave room at the bottom for data. Use Ymin to set this.
Example settings are given below:
 - SHIFT F3 (V-Window)
 - View Window

Xmin	: 0
max	: 1.8
scale	: 0.1
Ymin	: -0.2
max	: 1
scale	: 0.1
6. EXE (to save settings.)
7. F6 DRAW (to view graph.)
8. To find the instantaneous velocity for your graph you will need to find the slope of a line tangent to the curve at different points along the curve. Use the following steps:
 - SHIFT F4 Sketch
 - F2 Tang (for the tangent of the curve)
 - Now move you your left and right arrow cursors to a position on the curve where you would like to find the tangent and then type EXE to draw the line.
9. Make a data table to record the value of “X=” and “dY/dX=” from the bottom of your screen. The value X represents the Time and dY/dX represents the Instantaneous velocity at that specific time.

10. Select five to eight evenly spaced points along the curve from which to collect and record the data. To do this you must repeat steps 8 – 10 for each data point. Make sure you spread out these data points to reflect the whole curve.
11. Now using your data table of Time and Velocity, plot a graph on the Casio of V vs. T. Use the following steps:
 - 2 STAT
 - Type Time values in List 1 and Velocity values in List 2.
 - SHIFT F3 V-Window (Again adjust the screen window for the data in this graph)
 - F1 GRAPH
 - F6 SET (Set specifics for your graph by the menu items.)
 - EXIT
 - F1 GRPH1 (To show the graph.)
 - F1 X (To show equation data.)
12. This screen gives you the general equation for the formula. Also make note of “a=”. This is the slope of your line.
13. Make a sketch of your graph and write your math model for this graph.
14. Record your slope including the units and state what you believe the slope represents.