Graphical Analysis Using Logger Pro 3.6

Find the mathematical relationship between distance and time for a ball rolling down a hill. The distance was measured for a ball rolling 1.0 s, 2.0 s and so on.

time	distance
(s)	(cm)
0.0	0.00
1.0	1.98
2.0	8.12
3.0	17.55
4.0	32.67
5.0	51.00
6.0	72.17



- 1. To open the program, go to My Computer>Local Disk (C:)>Program Files>Vernier Software>LoggerPro 3 and click on LoggerPro.exe. The window above on the right will come up.
- 2. Under "Data Set", double click the "X". Enter the "Name" of the independent variable you are graphing on the x-axis, a letter for the "short name" (i.e "t" for "time") and the units (i.e. "s" for "seconds").

Manual Column Options	×
Column Definition Options	
Labels and Units:	Generate Values
Short Name: Units:	Start: 1
Lock Column (Prevent Cell Editing) Data Type: Numeric	Increment:
	Number of cells: 100
Help	Done Cancel

3. Now click the "Options" tab on the same window. Under "Displayed Precision", choose the correct number of decimal places or significant figures for your data from the pull-down menu. Repeat steps #2 and #3 for the "Y" (y-axis).

Point Protectors: Style: Empty S © Display every 1 © Use Column Displayed Precision:	quare V Size: Medium V Color:	black 💌
Automatic C Decimal Places Significant Figures Use Scientific Notation	Percentage Firror Constant +/-: Use Column:	

- 4. Enter your data in the cells under the appropriate column. If you click "Enter" after entering a value, you will automatically go to the next cell across. If you use the down arrow button instead, you will go to the next cell down.
- 5. Click "Autoscale Graph" (Autoscale Graph") (Autoscale Graph" (Autoscale Graph") (Autoscale", click on the lowest value and type "0" into the box that comes up for both axes.



 Click on the graph window. Go to Options>Graph Options. Type in a title for your graph. Under "Appearance", the only box that should be checked is "Point Protectors".

Examine: Interpolate Mouse Position and Delta Legend New Data: Add New Data Sets and Columns Grid: Major Tick Style: Minor Tick Style:	Appearance: Point Protectors Connect Points Bar Graph Y Error Bars X Error Bars Draw Visible Spec Solid No Line	Note: Error bar calculations and Point Protector styles are set in the Column Options dialog for each column. thrum (Wavelength Graphs)
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7. Click "Axes Options" on the same window. Make sure that "Bottom" on the y-axis and "Left" on the x-axis have the value, 0.

Y-Axis:	Right Y-Axis:
Label:	Label:
Y-Axis Columns:	Right Y-Axis Columns:
Data Set Dime (s) Vidstance (cm)	Data Set Data Set distance (cm)
Log Axis Scaling: Autoscale Larger Top: 80 Bottom: 0	Log Avis Sceling: Autoscale Larger Y Top: 100 Bottom: 0
X-Axis: Column: time (s)	Scaling: Autoscale Larger
Rotate Tick Labels 0 💌 Degrees	Left: Right:

8. To fit a line to your data, click the graph. Holding the left mouse button down, drag a box from the upper left corner to the lower right corner to highlight your

points in gray. Go to Analyze>Linear Fit or this button, In the box that comes up, you are given the slope and y-intercept of the best fit line. "Correlation" is a number that tells you how well the data fits this line. the better the fit, the closer this value is to '1". Note that in this case, the line doesn't hit very many points. We may be able to get a correlation value closer to 1 than 0.9796.



9. Click the data set. Go to Data>New Calculated Column. Since this data appears to be a top-opening parabola, we want to graph y vs x², or in this case distance vs time². Type in the name of the new data column (i.e. time²), the short name (t²) and the new units (s²). Note you can use the pull-down menu to get a superscript. In "Equation", under "Variables (Columns)", choose the name of the column you want to manipulate (in this case "time"). To raise this to a power use "^" (^2 to square it). Additional functions +, -, / (divide), * (multiply).

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1	0.0	0.00				
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3	2.0	0.12				
5	4.0	32 67	Column Definition Options			
6	5.0	51.00	Labels and Units:			
7	6.0	72.17	Name: lime			
8			GreekLower			
10			Short Name: 12" Units: 12" Greek Upper			
11			Destination: 0			
12			Data Set: Data Set			
13			3			
14			Equation: 4			
16			6			
17			Functions > Variables (Columns) > Parameters > 8			
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12	Equation					
	"time"^2					
	5		Unit line (Column 2) x			
	Func	:tions >	variables (Columns) > Parameters >			

Go to Insert>Graph. On the new graph graph. Click the label on the x-axis. A pull-down menu comes up. Choose the name of your new data column (in this case time²). Do the same for your y-axis (in this case chose "distance"). You can resize any of the



data and graph windows by clicking on them and dragging the boxes in the corners. Make everything fit within the window, so that when you go to **File>Print** everything will be visible.

- 11. Repeat step #8 to fit a line to this data. Note in our example that the new correlation is 0.9999 which is much closer to 1.
- 12. Write the equation for the line with the best correlation. (in this case: $d=(2.071 \text{ cm/s}^2) \text{ t}^2$, the yintercept falls within the 5% rule and can be set to zero.)

