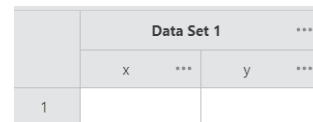
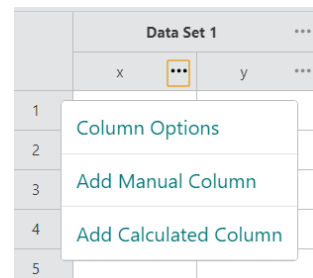


Using the Vernier Graphical Analysis (VGA) Application to Graph Data and to Develop Mathematical Models

Collect your data, paying attention to independent and dependent variables.



- 1a) In VGA, enter your independent variable data in the 'x' column,
- 1b) In VGA, enter your dependent variable data in the 'y' column.



2) Click on the three dots on the data columns and select 'Column Options' and label them with the variable names and units.

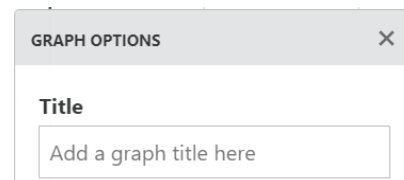
3a) In the lower left hand corner, click the icon.

3b) Select 'Edit Graph Options'.

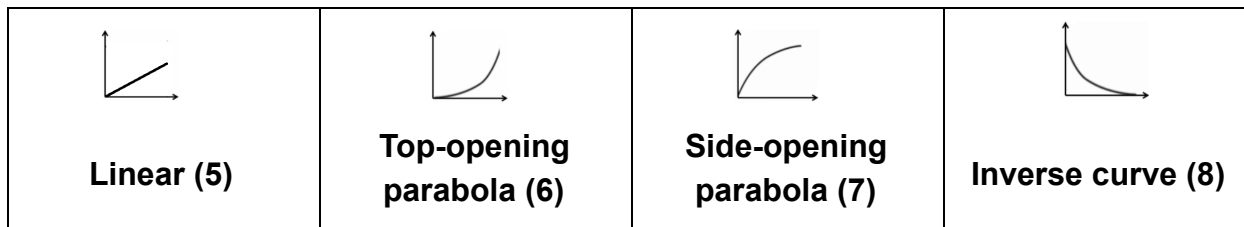
3c) Enter a title name for the graph.

3d) Select 'Both' for points and lines.

3e) Select 'Always show 0' for axis range



4) Determine the shape of the graph.



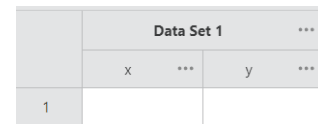
5) Linear: click the  icon, and select 'Apply Curve Fit'. Select 'Linear'. Click 'Apply'.

Examine the information box on the graph. There is a 'r' with a number directly behind it. This number is the correlation of how linear the line is. The closer it is to 1.000, the more linear it is. If this number is lower than .9950, you might consider that the line is not linear, or that it should be linear but the data has errors. The final decision is yours, not mine.

In order to test the other 3 types of curves, you must create a test plot in an attempt to linearize the line. If you determine the test plot to be linear, then you can determine the mathematical relationship between the 2 variables. If the test

plot is determined to not be linear, perhaps the data is inaccurate, or further manipulation of the line is necessary.

6) Top-opening parabola: Click the three dots next to the variable name in the 'x' column of the data table. Select 'Add Calculated Column'.



	Data Set 1		...	
	x	...	y	...
1				

Enter an appropriate name and units for the calculated column.

Click "INSERT EXPRESSION". Then select $A \cdot X^B$. In parameter A, enter '1'. For column, select "X". For parameter B, enter '2'. Then click "APPLY".

What you have just done is create another column in the data set that has squared every value in the 'X' column.

Goto Step 9

7) Side-opening parabola: Click the three dots next to the variable name in the 'y' column of the data table. Select 'Add Calculated Column'. Enter an appropriate name and unit for the calculated column. Click "INSERT EXPRESSION". Then select $A \cdot X^B$. In parameter A, enter '1'. For column, select "Y". For parameter B, enter '2'. Then click "APPLY".


What you have just done is create another column in the data set that has squared every value in the 'Y' column.

Goto Step 9

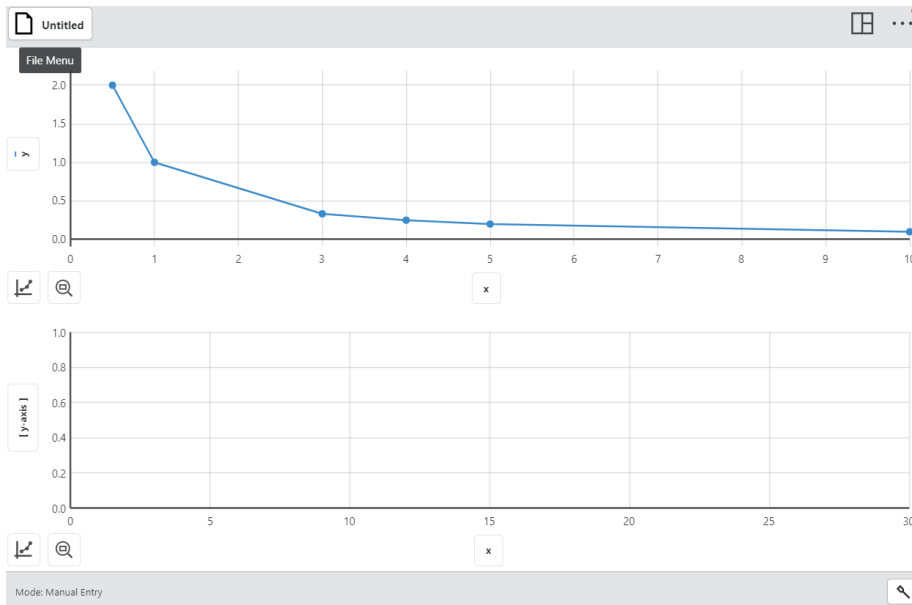
8) Inverse Curve: Click the three dots next to the variable name in the 'x' column of the data table. Select 'Add Calculated Column'. Enter an appropriate name and unit for the calculated column. Click "INSERT EXPRESSION". Then select A/X . In parameter A, enter '1'. For column, select "X". Then click "APPLY".

What you have just done is create another column in the data set that has calculated the inverse of every value in the 'X' column.

Goto Step 9

9) In the upper right hand corner click the  icon. You will see the prompt on the right side of this paragraph. Click on '2 Graphs'. You should now see 2 separate graphs in VGA. The top graph should be the graph you've been working with. The bottom graph may or may not be empty (see below).

1 Graph
2 Graphs
3 Graphs
Table
Meter
Graph and Table



Now you have two options. Read carefully.

OPTION 1 (calculated column Y)	O R	OPTION 2 (calculated column X)
On the bottom graph, click the label on the y-axis. If you made a calculated column for the y-axis, select it. Then click the label on the x-axis and select the variable that was on your x-axis in the top graph.		On the bottom graph, click the label on the x-axis. If you made a calculated column for the x-axis, select it. Then click the label on the y-axis and select the variable that was on your y-axis in the top graph.

You should now have a line on your bottom graph.

Go to Step 4.