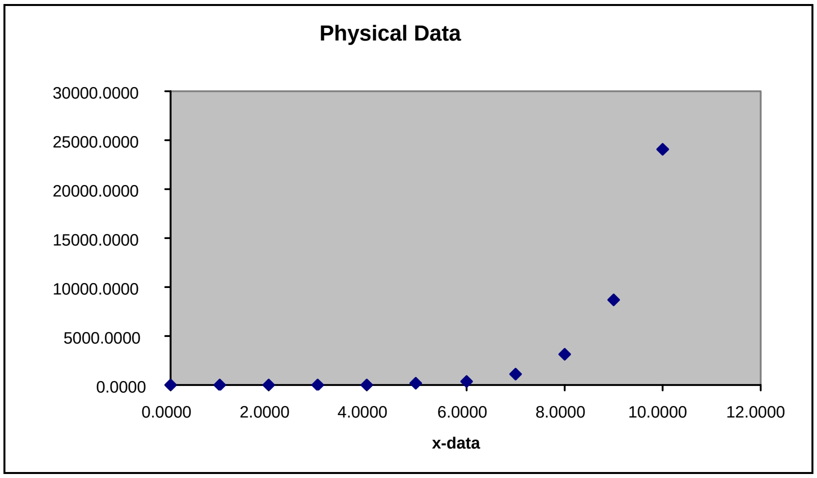
DATA FITTING TUTORIAL BY G. L. GRAY

This is a quick introduction to teach you how to do nonlinear curve fitting in Microsoft Excel. What is “nonlinear curve fitting”? Well, say you have taken some data that is a result of some underlying physical process and that your data looks like that shown below.



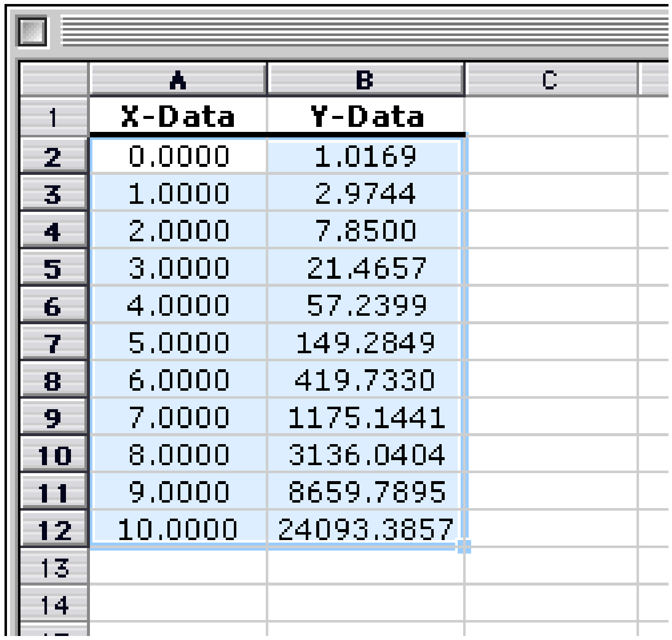
You might want to model this process or see that it fits a model that you already have. Since this data is clearly not linear, how do you find the “best” equation that fits the data? That is where *nonlinear curve fitting* comes in.

Nonlinear Curve Fitting

You begin by entering your data into Microsoft Excel. To do this, simply run Excel and enter your data as shown below.

	A	B	C
1	**X-Data**	**Y-Data**	
2	0.0000	1.0169	
3	1.0000	2.9744	
4	2.0000	7.8500	
5	3.0000	21.4657	
6	4.0000	57.2399	
7	5.0000	149.2849	
8	6.0000	419.7330	
9	7.0000	1175.1441	
10	8.0000	3136.0404	
11	9.0000	8659.7895	
12	10.0000	24093.3857	
13			
14			

The data corresponding to the abscissa or x-axis should be in the left column and the data corresponding the ordinate or y-axis should be in the right column. After entering your data, select it as shown below (it works best if you just select the data and not the headings). Notice that the cells are colored when they are selected.



	A	B	C
1	X-Data	Y-Data	
2	0.0000	1.0169	
3	1.0000	2.9744	
4	2.0000	7.8500	
5	3.0000	21.4657	
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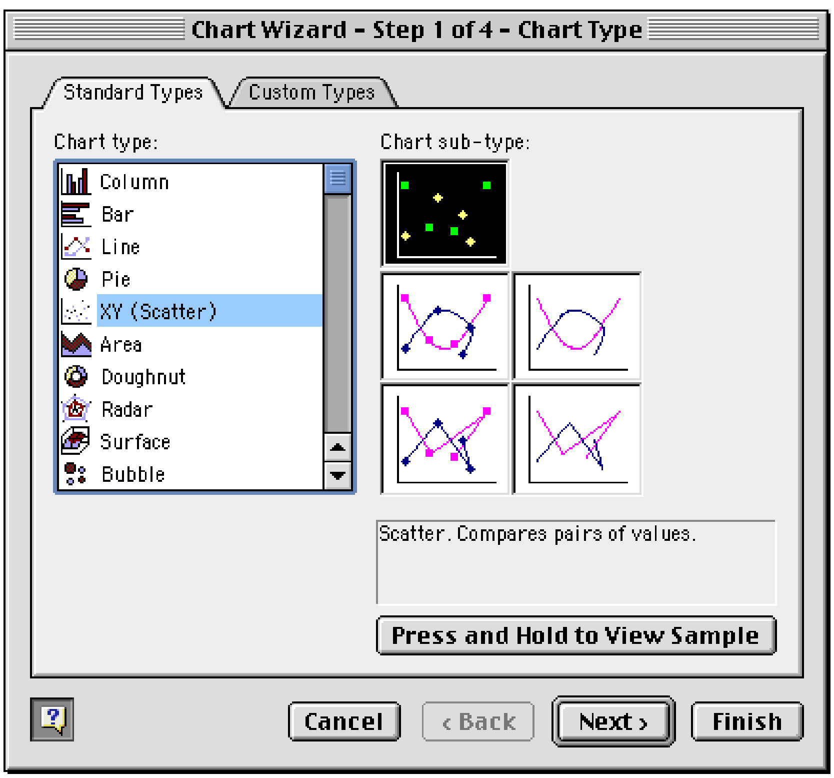
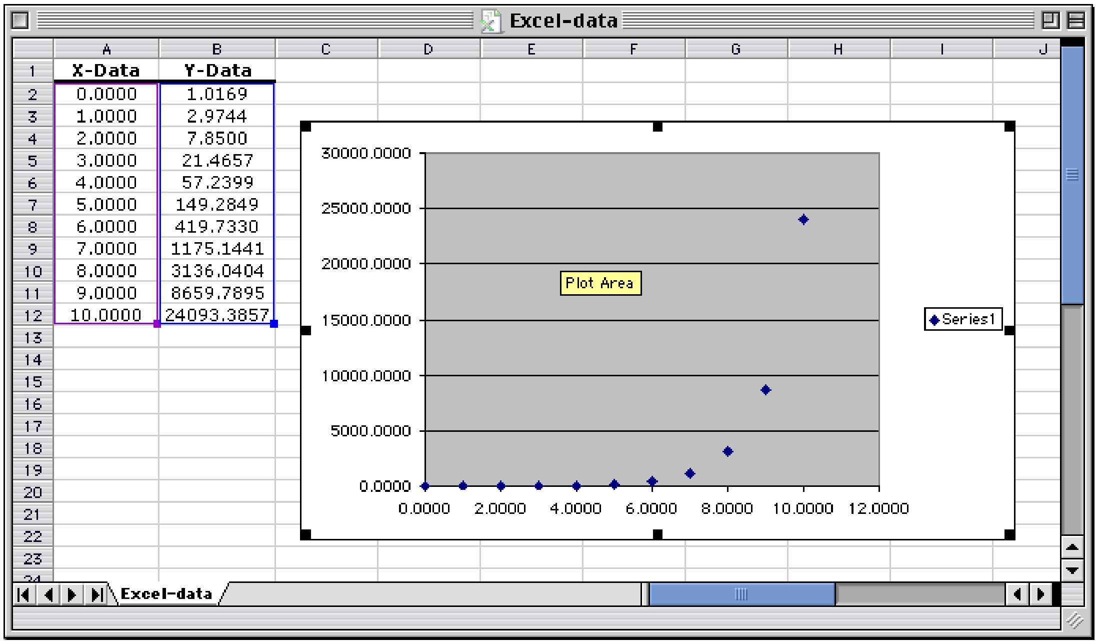
12	10.0000	24093.3857	
13			
14			

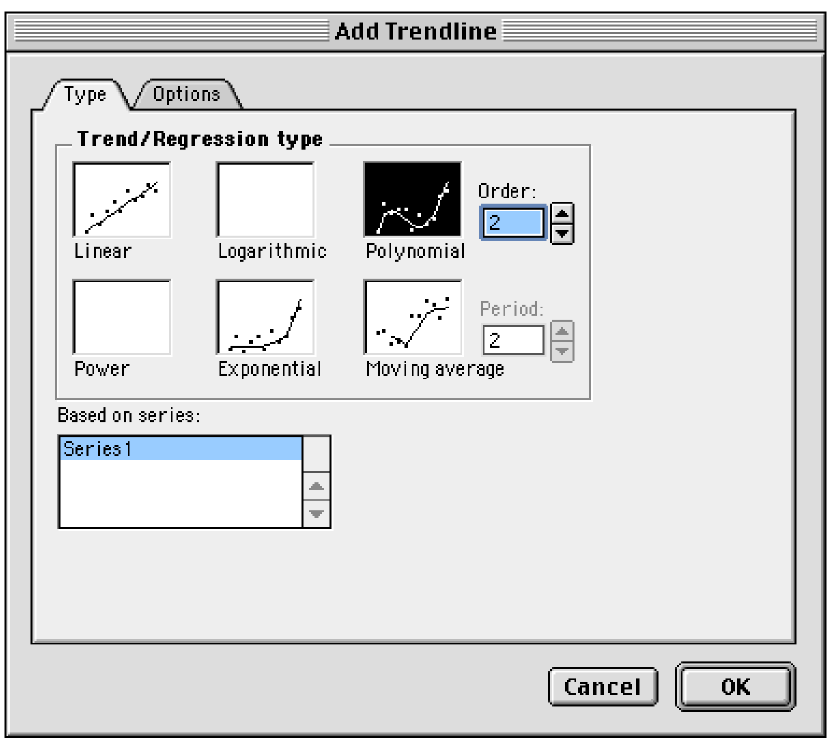
Now go to the “Insert” menu and select “Chart…”. A dialog box will appear in which you should select the “XY (Scatter)” type of plot as shown below.



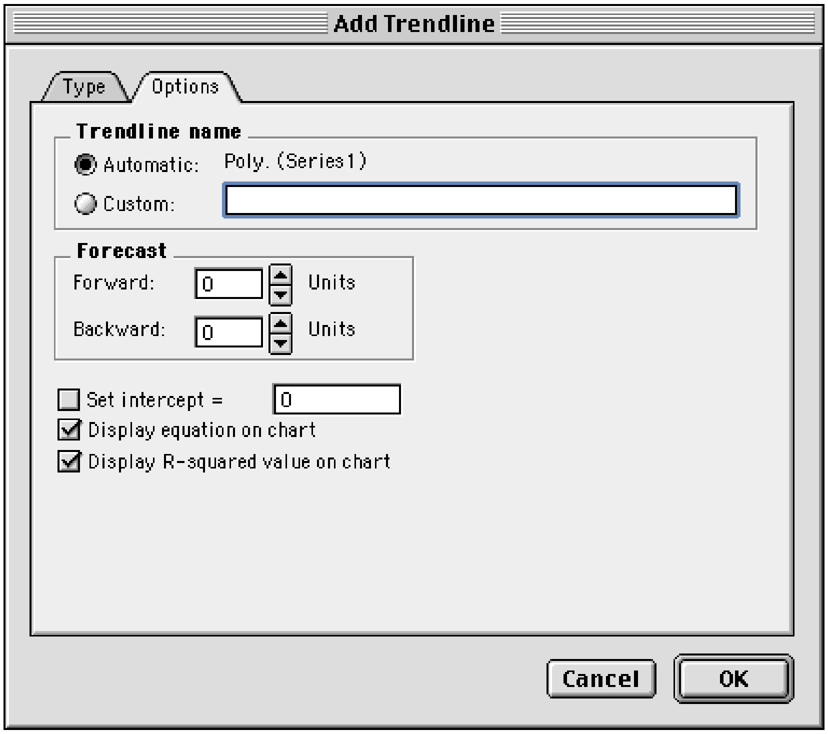
Now you can either click the "Next" button if you want to modify some of the finer points of the plot or click on "Finish" to get the plot. Your spreadsheet should now look something like the picture shown below.



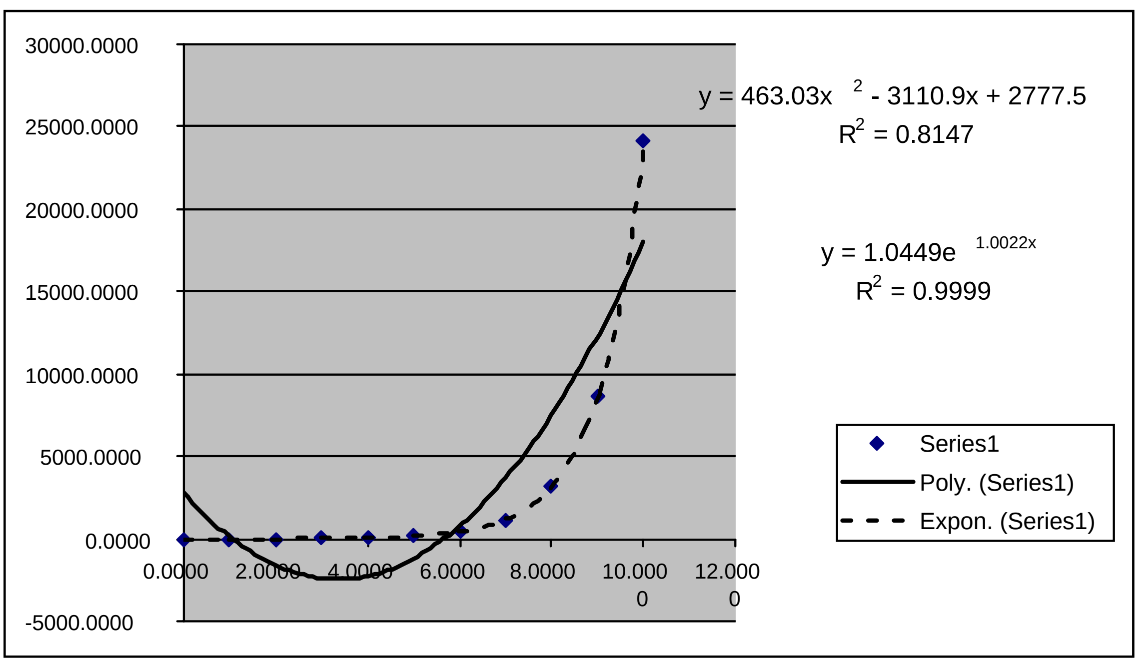
Now, select the picture as shown and go the "Chart" menu and select "Add Trendline…". Note that if you do not select the plot, a "Chart" menu will not appear. In the "Add Trendline" dialog box that appears, you will now need to choose the type of curve to fit to your data. In this case, I will choose a second-order polynomial as shown below.



Then click on the “Options” tab and tell Excel that you would also like it to display the Equation and the R-squared value as shown.



Now click the “OK” button and the curve as well as the equation and the r-squared value will appear on your plot. Notice that this curve does not fit the data too well (you can see this visually as well as with the low r-squared value), so I will now add another type of curve, in this case an exponential curve. Both curves are shown below.



Notice that the dashed exponential curve visually fits the data very well and has an r-squared value that is nearly one. You could try other curves, but you will find that the exponential curve is by far the best fit. With this in mind, you can see that the equation of the curve is approximately

$$y = 1.045e^{1.00x}$$

In fact, the equation I used to originally generate the data was $y = e^x$ with a little bit of random noise added to the *y*-value of each data point.