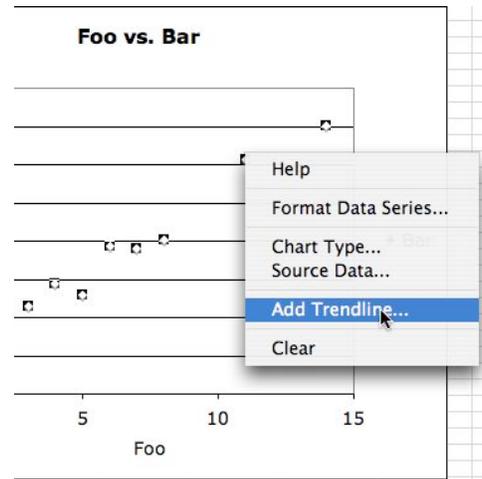


Physics 305 Hints: Using LINEST in Excel

Microsoft Excel™ is particularly convenient for organizing data, manipulating data and ultimately for displaying graphs of ordered pairs of data. The trendline feature in Excel makes identifying the “best-fit line” nearly completely effortless. The equation of the trendline can be displayed on the chart by clicking on the “options” menu at the appropriate stage while developing the graph and then clicking on the box labeled “display equation on sheet”. Alternatively, you can right-click [control-click on Macintosh] on the best fit line on an existing graph and select “Add Trendline” or “Trendline Options” to access this feature. Information on the slope and intercept of the trendline are reported on the finished product. But for many circumstances in physics, this is not enough! We often need to also know the uncertainties in these quantities.



Showing the result of “right-clicking” on the data in a plot in Excel to access the Trendline feature.

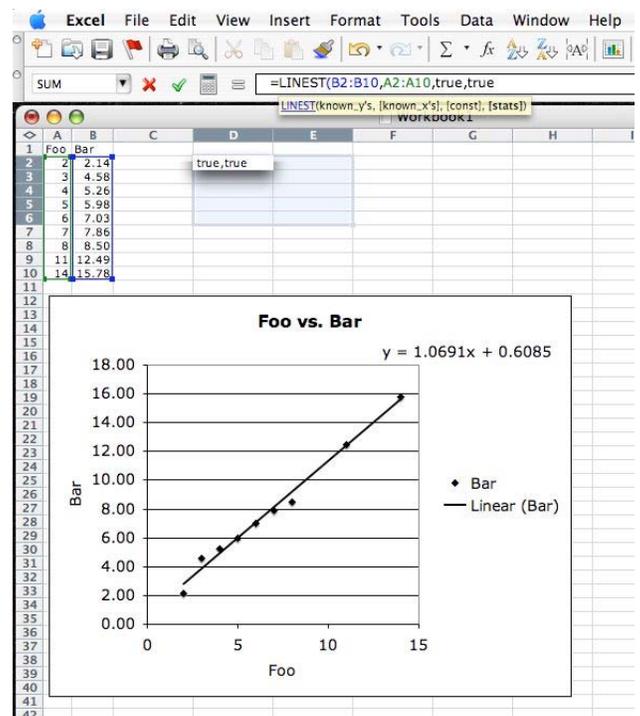
It turns out that Excel has a particularly convenient utility for carrying out such calculations: A function called LINEST (which stands for LINE Statistics). To access the uncertainties in the slope and intercept do the following:

1. Using the mouse, highlight a region of empty cells that is two columns wide by five rows tall. This is where you will be inserting the results from LINEST.
2. Without deselecting the highlighted region, go to the formula bar and type the following

`=LINEST(ydata,xdata,true,true)`

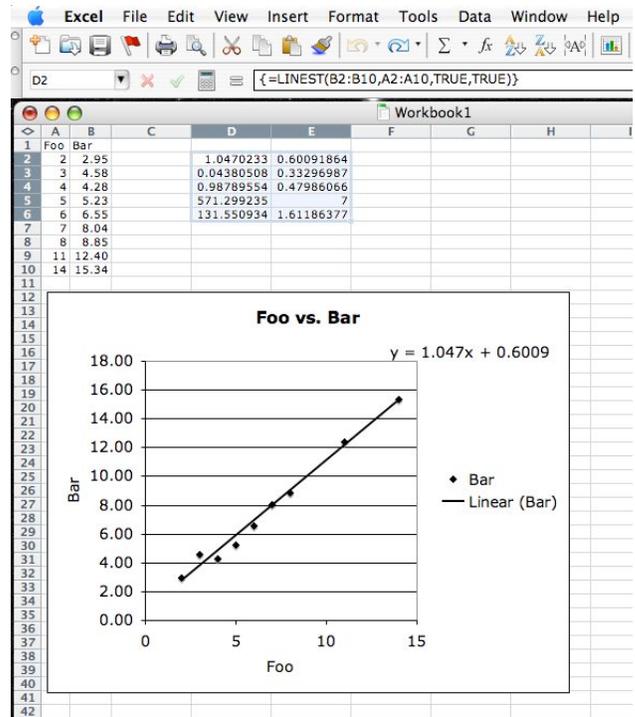
NOTE: “ydata” indicates the cell numbers corresponding to the range of y data (e.g. – it might read B2:B10 if you have y data in cells B2, B3,...,B10). The words “true” ought to literally appear as true comma true.

The figure to the right shows someone entering the appropriate line (except for the final parenthesis).



- Next, instead of hitting “Enter” simultaneously type “shift-ctrl-enter”. That is, depress and hold down the shift key, the control key, and finally, the enter key. Note that on Macintosh systems, you need to replace the “enter” key in these instructions with the “return” key.

As shown in the figure to the right, a 2x5 matrix of numbers should appear in the highlighted cells. The upper left column is the slope, while the upper right number is the intercept. The second row holds the uncertainties in those numbers. In particular, the uncertainty in the slope is the second number down from the top in the left-most column. For the example from the figure, a zoomed in version of the figure labels all the values below.



You are at this stage prepared to report the slope as well as the uncertainty in this slope. It is as simple as that!

	A	B	C	D	E	F
1	Foo	Bar				
2	2	2.95	Slope	1.0470233	0.60091864	Y-Intercept
3	3		Unertainty (Slope)	0.04380508	0.33296987	Uncertainty (Y-Intercept)
4			Correlation Coefficient (R ²)	0.98789554	0.47986066	Standard Error for y estimate
5				571.299235	7	Degrees of Freedom
6	6	6.55	F Statistic	131.550934	1.61186377	Residual Sum of Squares
7			Regression of Sum of Squares			
8						
9	11	12.40				
10	14	15.34				
11						

The results of `LINEST(ydata, xdata, true, true)` identified.