

Excel Instructions for Physics Lab

Writing a formula/ doing calculations

Use an equal sign (=) to precede the formula. For example, if you want to compute the average of numbers that are in cells A1 through A12, then in a empty cell write =average(A1:A12).

The following symbols are used for the operations:

+	addition
-	subtraction
*	multiplication
/	division
^	exponent

Suppose you want to write a formula for the expression $\frac{x^2 y}{z + w}$, where x is in cell A1, y is in cell A2, z is in cell B3, and w is in cell B5. The formula could be written in cell C2 as =A1^2 * A2/(B3 + B5).

Copying a formula

If you have written a formula in cell B1 and you want the exact formula in cells B2 through B10, then position the cursor in the lower left hand corner of selected cell B1 until the cursor becomes a black cross. After the cursor becomes a black cross, click and drag from cells B2 through B10. Note that any cells written in the formula of B1 will be shifted when the formula is copied unless the cells written in the formula of B1 is written with \$ symbols, such as \$A\$2. For instance, if B1 contains =2*A1 and you copy B1 to B2, then B2 would contain =2*A2.

Some built-in functions

In the following, x represents a number or a cell. If a set of numbers are used in the formula, they are assumed to be in 'cell 1' through 'cell 2'.

absolute value	=abs(x)
average	=average(cell 1:cell 2)
standard deviation	=stdev(cell 1:cell 2)
add a set of numbers	=sum(cell 1:cell2)
square root	=sqrt(x)
exponential, base e	=exp(x)

The function wizard, f_x , on the toolbar will bring up a dialogue box where all the built-in functions are listed.

Making Graphs/Curve-Fitting

Selecting the numbers. First, you must select the numbers that you want to plot. If you want to plot column B versus column A, then select the cells in those column that contain the numbers. If you want to plot column C versus column A, without plotting column B, then first select column A, then hold down the *Ctrl* key while selecting column C. Note that the selected column on the left will be plotted on the x -axis. You may also just select one column of numbers, if that column is to be plotted one of the axes, equally spaced.

The Chart Wizard. Click on the *Chart Wizard* icon on the toolbar. Select *Scatter Plot* if you want to plot the left column on the x -axis and the right column of the y -axis. Also select the sub-type. For data, plot the points without connecting them. For functions, you may want to display the curve without displaying the points.

Continue to work your way through the *Chart Wizard*. Set up appropriate gridlines, labels, and a title. These may be changed later by selecting the graph and clicking on *Chart* → *Chart Options*.

Adding a Second Graph. You may plot two or more graphs simultaneously. Select the columns with the points. The left column will be on the x -axis, and each of the other columns will be plotted independently on the y -axis, if a scatter plot is chosen in the *Chart Wizard*. This method assumes that the points of both graphs have the same x -coordinates. If this is not the case, then you will need to plot the first graph, then add the second graph as follows: select the graph, then select *Chart* → *Source Data*, then select the *Series* tab and select *Add*; position the cursor in the x -values line and use the mouse to select the cells that contain the x -coordinates; do the same for the y -coordinates. You may name each data series in the name line.

You may also add the second data series while you are working your way through the *Chart Wizard* for the first graph. In Step 2 of the *Chart Wizard*, click on the *Series* tab and follow the same procedure as before.

Error Bars. Error bars may be added by double clicking on any one of the points to pull up the *Format Data Series* dialogue box. If each point has a different error bar, then you must set up a column with the error for each point and choose a *Custom* error bar.

Curve Fitting. The built-in curve fitting procedure is started by clicking on *Chart* → *Add Trendline*. (Alternatively, you may right-click on one of the data points and select *Add Trendline*). Select the type function. Select *Options* to *Display Equation*, to *Display R^2 value*, or to *Set Intercept* to a particular value. The equation and R^2 value may be dragged to any place on the chart.

Uncertainty in fitting a line. When you fit a line and determine the slope and intercept, you also want the uncertainties in the slope and intercept. The slope and intercept may be found from the *Display Equation* option. They, along with the uncertainties, are also found using the *Linest* built-in function. Select a 3x2 block of empty cells. Then, type = and click on the *Function Wizard*, f_x , on the toolbar. Select the function *Linest* to bring up the *Linest* dialogue box. Use the mouse to select the cells with the ranges for y and x ; make sure that the correct cell ranges appear in the appropriate line of the *Linest* dialogue box. Enter the word true for both the const and stats line in the dialogue box. Do not press *Enter* or click on *OK*. To finish and to get the values for the slope, intercept, and uncertainties, simultaneously hold down the *Ctrl* and *Shift* keys, then press and release *Enter*. The upper left cell of the 3x2 block now contains the slope, while the middle left cell now contains the uncertainty in the slope. Similarly, the upper right cell now contains the intercept, while the middle right cell contains the uncertainty in the intercept. The lower left cell contains the R^2 value. Ignore the lower right cell.