Working with Spreadsheets

Purpose: To get familiar with electronic spreadsheets by using them in some simple applications.

Equipment: Computer with EXCEL software.

Procedure:

1. Your instructor will give you a brief explanation of how a spreadsheet works and show you some of the basic operations and functions.
2. Turn on the computer and load Excel software by clicking on **Start**, move the mouse over **Programs** them move the mouse over **Microsoft Excel** and then press the left button.
3. Create a simple spreadsheet that calculates the values of the following function:

   $$f(x) = A \sin(Bx + C)$$

   Initially choose values for of $A = 5$, $B = 3$ and $C = \pi/3$. Place these values at the right side of the spreadsheet in the region reserved for constants. Put the words amplitude, frequency, and phase next to each as an explanation for the meaning of each constant. Place column headings for "x" and "f(x)" near the middle of the spreadsheet, enter a zero in the cell below "x", and enter the formula shown above in the cell below "f(x)". Be sure to put an equal sign in front of the formula. Create a column for values of x that run from zero to 10 radians in steps of 0.1 radians. Use the copy feature to create these x values (Don't enter them all by hand!). Similarly, create in the next column the corresponding values of f(x) by copying the formula shown above down through the same number of rows (100 in all).
4. Once the generated data looks reasonable, copy this data onto the clipboard by highlighting the contents of the two columns and choosing **EDIT/COPY** from the menu bar. Print out a copy of your spreadsheet (first 20 rows or so) and also print out the spreadsheet formulas (try CTRL~). Be sure that your rows and columns are numbered and lettered.
5. Minimize the spreadsheet window and run the Graphical Analysis program by opening the **Physics Apps** icon (double click the mouse on the icon) and then double click on the **Graphical Analysis** icon. Once the program loads, click on the top of the x column and then choose **EDIT/PASTE** to place the data from the clipboard into your graphing program. A graph of the data should appear in the graph window. Put appropriate labels on the horizontal and vertical axes of the graph.
6. Highlight the portion of the graph you want to analyze and choose **ANALYZE/CURVE FIT** from the menu bar to direct the computer to find a function that best fits the data. From the list of possible functions, give the computer a hint as to what type of function you expect your data to match. The computer should display a value for A, B, and C that fit the sine curve that you are plotting. How do these compare with the values that you started with in your spreadsheet? Make a copy of the data and graph by selecting **FILE/PRINT**. Include this in your lab report.
7. Repeat the above process for a spreadsheet that calculates the position of a freely falling particle as a function of time. This time your constants should include the acceleration of gravity, the initial velocity, initial position, and the time increment. Start off with $g = 9.8$ m/s^2, $v_0 = 50$ m/s, $x_0 = 1000$ m and $\Delta t = 0.2$ s. Print out the spreadsheet (calculated results and formula as in part 4). Again copy the data into the Graphical Analysis program and obtain a graph of position vs time. Fit this data to a function ($y = A + Bx + Cx^2$) which closely matches the data. Interpret the values of A, B, and C. Get a printout of this graph with the data table. Include this printout in your lab report.