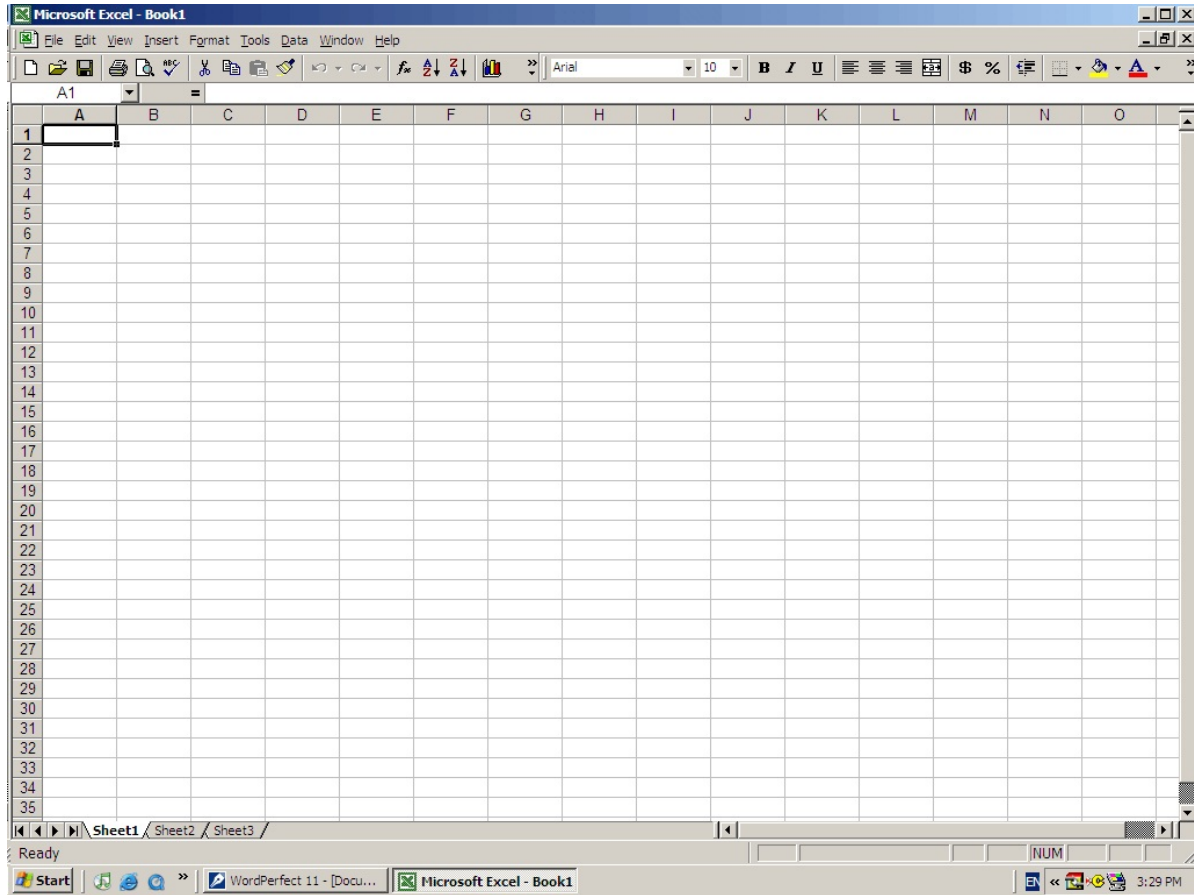# How to use Excel Spreadsheets for Graphing

1. Click on the Excel Program on the Desktop
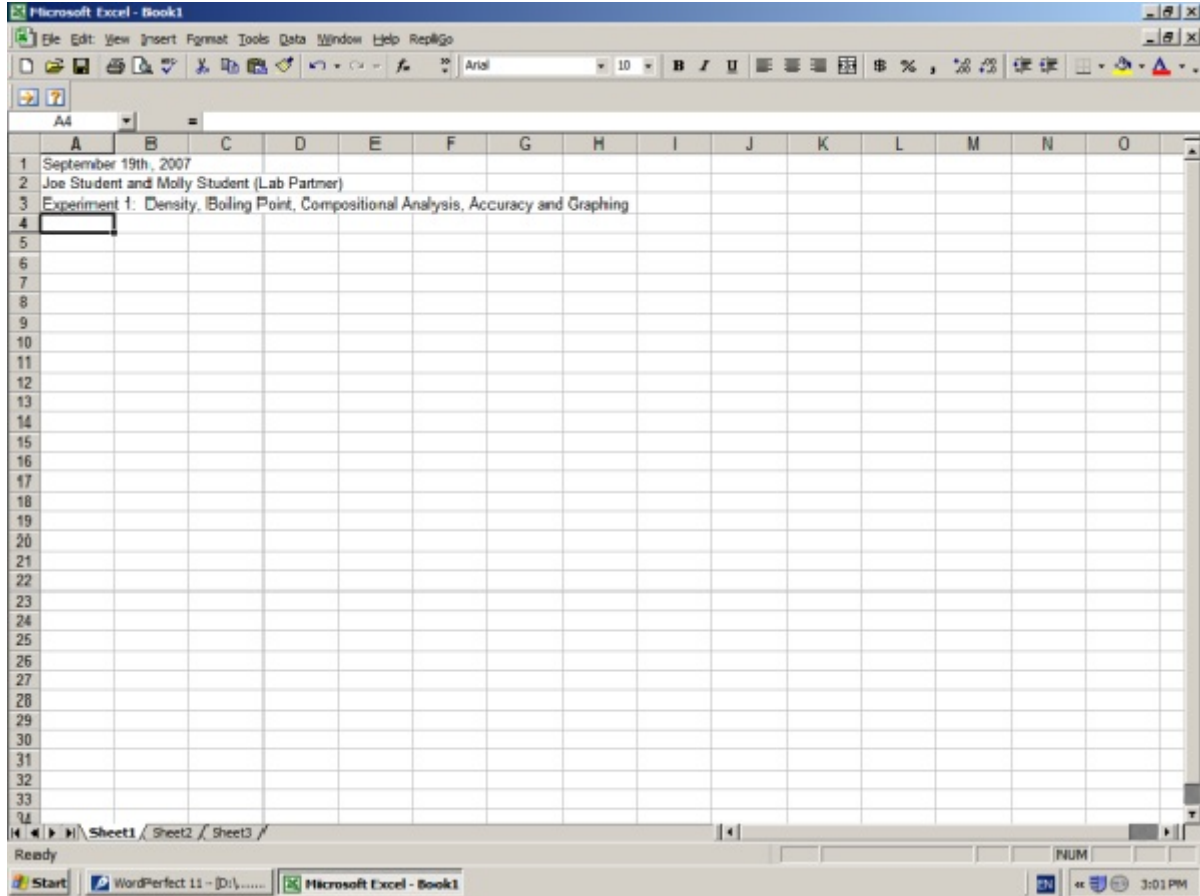

2. You will notice that a screen similar to the above screen comes up. A spreadsheet is divided into **Columns** (A, B, C,...) and **Rows** (1, 2, 3, ...). Each square (*cell*) has a location according to it's column and row.

In cell *A1*, we will put the Date.
In cell *A2*, we will put the student name (and partners if applicable)
In cell *A3*, we will put the name of the assignment.

To do this click on the cell with the mouse and enter the info on the keyboard.

3. We will now enter the data from our experiment. We can enter the data as was entered in our data sheets. (Note when you first enter the data, the text will run together. We will fix this on the next page.)

In B7 we will put "Sample #"
In C7 we will put "Initial buret reading"
In D7 we will put "Final buret reading"
In E7 we will put "Difference"
In F7 we will put "Total volume mixture"
In G7 we will put "Dry vial + cap"
In H7 we will put "After adding sample"
In I7 we will put "Difference"

4. With the mouse, highlight cells B7 to I7, (by left clicking B7 and dragging the cursor to I7)

5. While it is highlighted, right click on the mouse.

6. In the box the pops up, select "Format Cells", then click on the "Alignment" tab.

7. Under "Text Alignment" you will see the word "Vertical:" with a box and arrow beside it. Click on the arrow and select "Top"

8. Click on the box which says "Wrap Text" so that a check mark appears. Then click "OK"
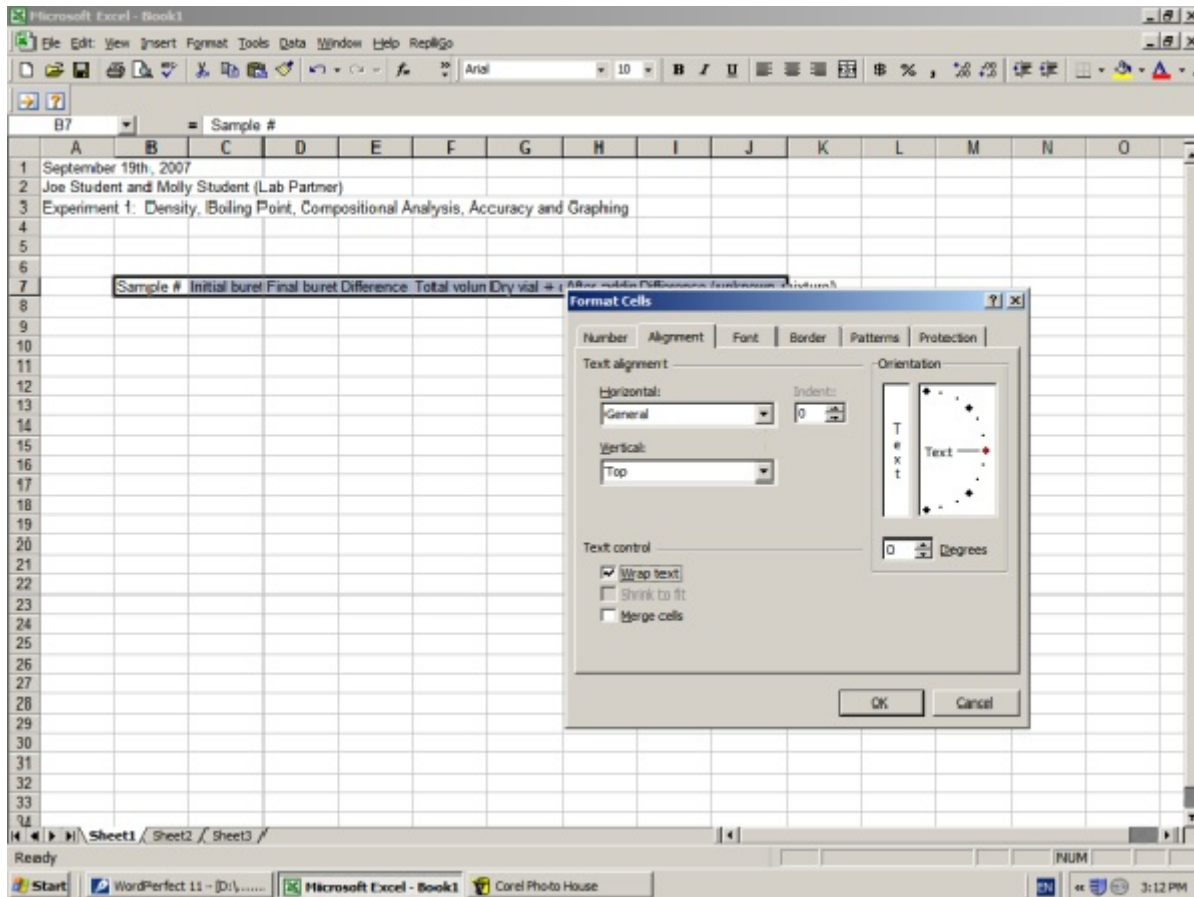
This will align the text so it looks nice.

9. We should put units over our data as well. In cell C6 type in

    mL

10. In cell G6 type in:

    g   (We will make it look nice on the next page)

The spreadsheet shows:

Row 1: September 19th, 2007
Row 2: Joe Student and Molly Student (Lab Partner)
Row 3: Experiment 1: Density, Boiling Point, Compositional Analysis, Accuracy and Graphing

Row 6 header units: mL (column C), g (column G)

| Sample # | Initial buret reading | Final buret reading | Difference | Total volume mixture | Dry vial + cap | After adding sample | Difference (unknown mixture) |

11. Highlight C6 to F6 and right click, then choose "Format Cells" then "Alignment"

   Click on the "Merge Cells" box at the bottom
   Under "Text Alignment" "Horizontal" choose "Center" then click OK

12. Follow the same procedure to center the "g" over G6 to I6
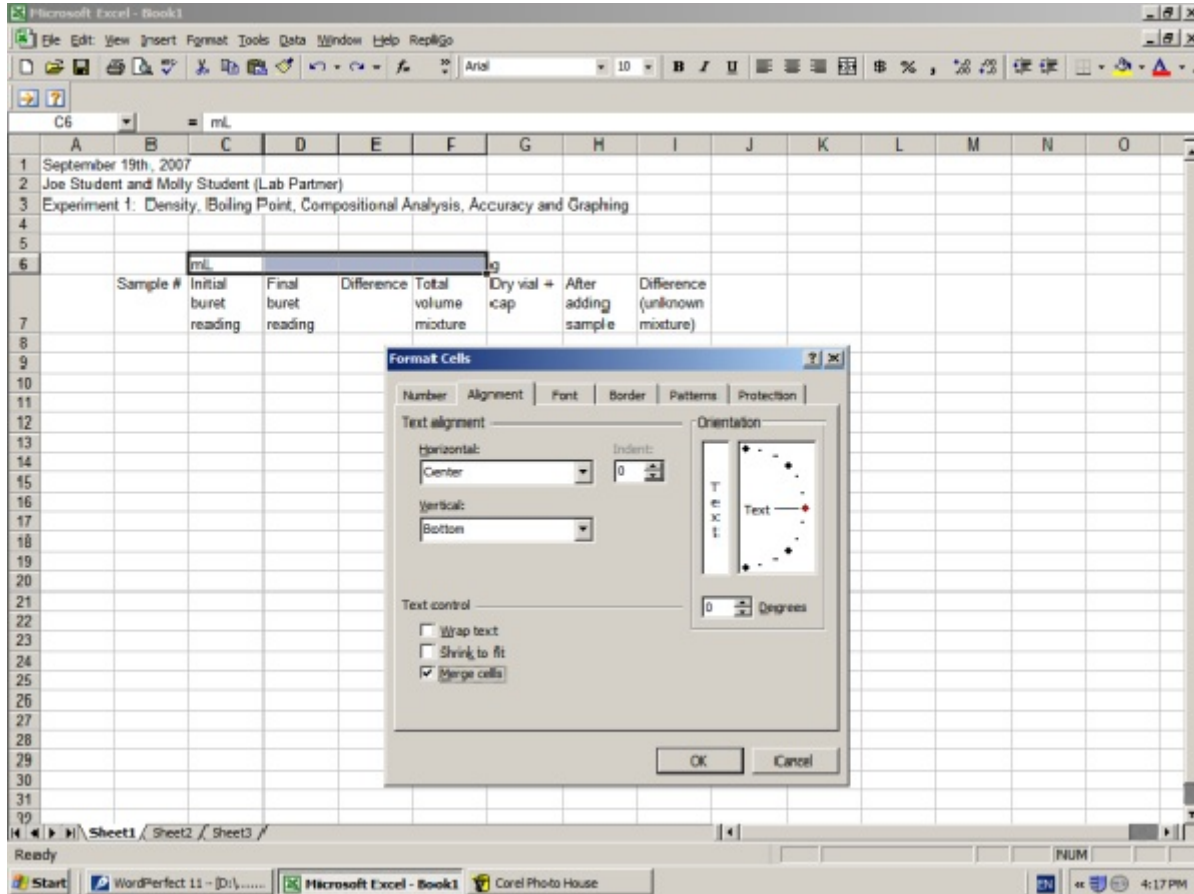
13. The raw data can now be entered into the spreadsheet. We will let the spreadsheet, however, do the calculations for us

You will notice that the numbers under volume may have been entered "3.30" on the computer but are displayed as "3.3" in cell C8.
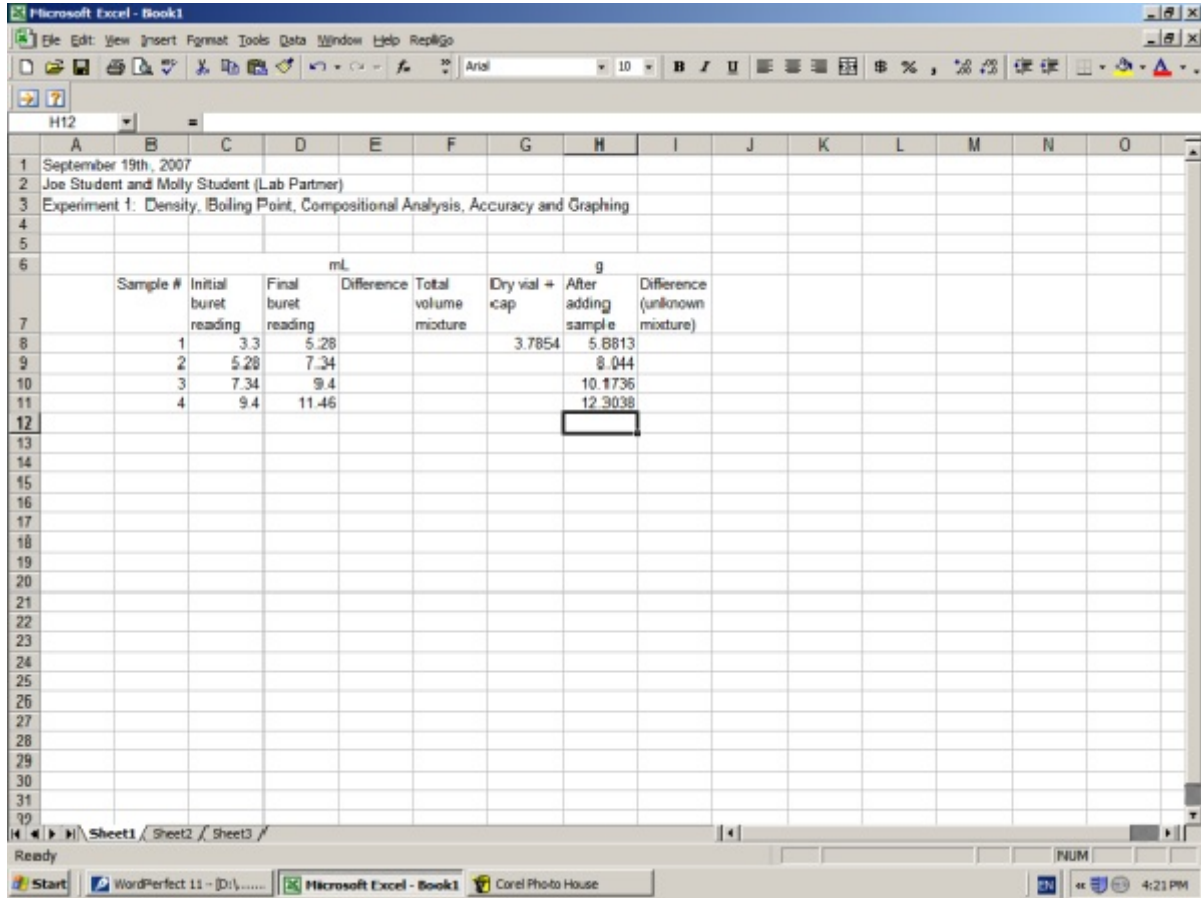
To correct this, highlight all the volume readings (C8 to F11), Right click, click on "Format",
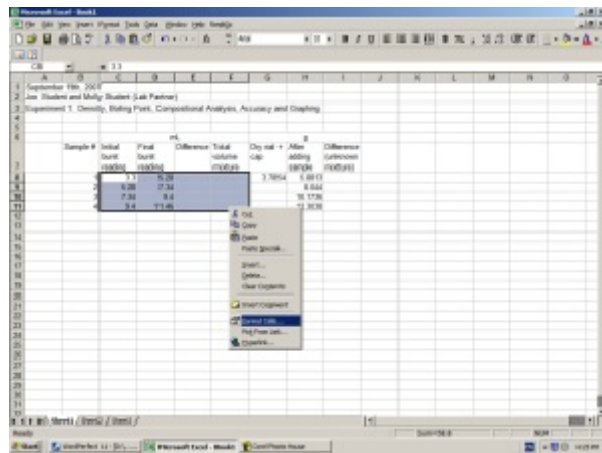
Now click on the "Number" tab at the top

Under "Category", select "Number", and choose "2 decimal places", then click OK.

This will give all the numbers in those cells, 2 decimal places.

Use the same method to give the cells from G8 to I11, 4 decimal places
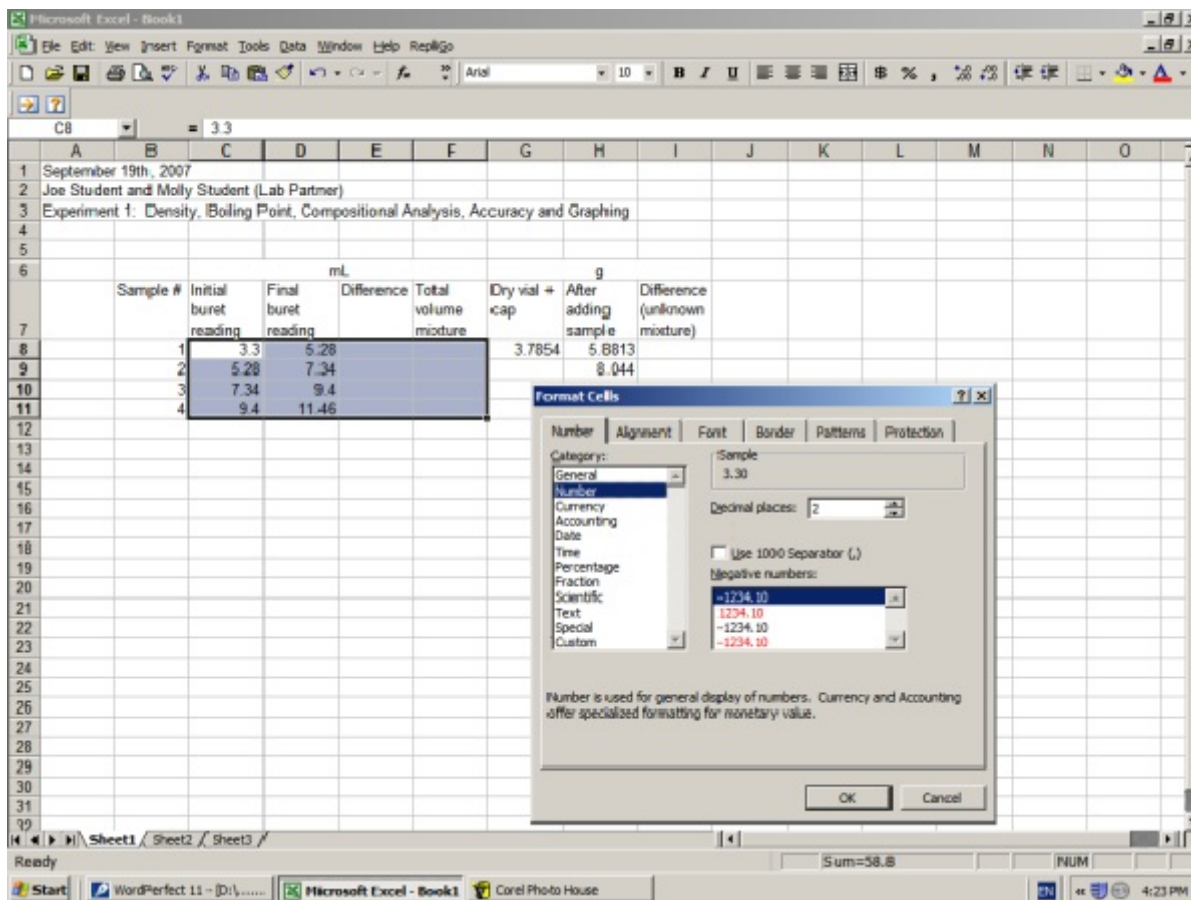
14. The power of a spreadsheet is that it will calculate numbers for you. To get the computer to calculate the difference between the Final and Initial buret reading we can enter the following code in E8

=D8-C8

The = sign tells the computer that the cell is a calculation, and that it should take the value of D8 and subtract the value of C8. (Note: This could be on the Lab exam, so learn how to do this.)
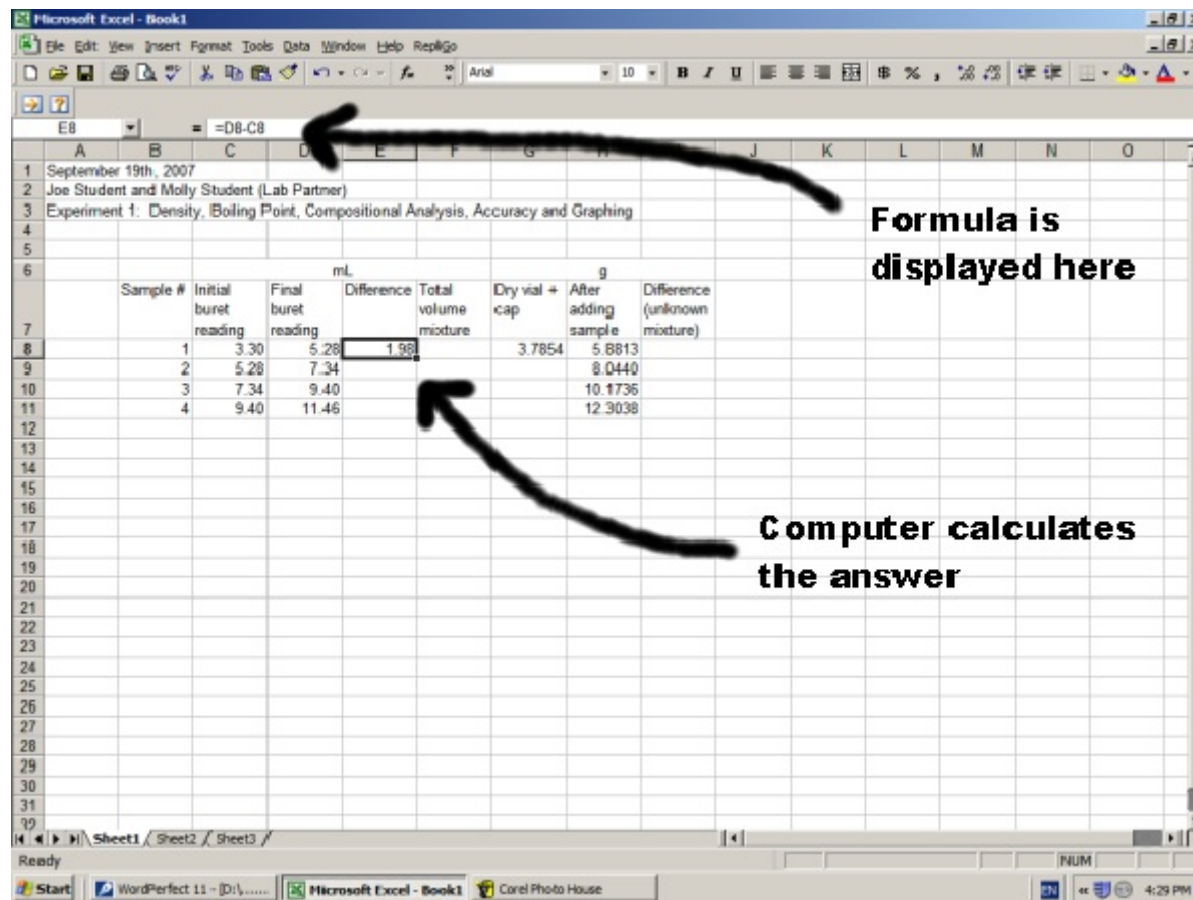
Notice that the code of the cell E8, is displayed near the top of the screen, but the cell E8 displays the subtracted value.

15. To get the spreadsheet to calculate the difference of the rest of the samples, highlight the cell E8, and then hit the buttons *Ctrl* and *C* at the same time on the keyboard. This will copy the code contents (the formula) in cell E8.

16. Highlight E9 to E11, then hit *Ctrl* and *V* on the keyboard. This will paste the code in.

> If you click on the cell E9, you will notice that the code is not quite the same as E8, it has adjusted the values so that it calculates the difference between D9 and C9, instead of D8 and C8
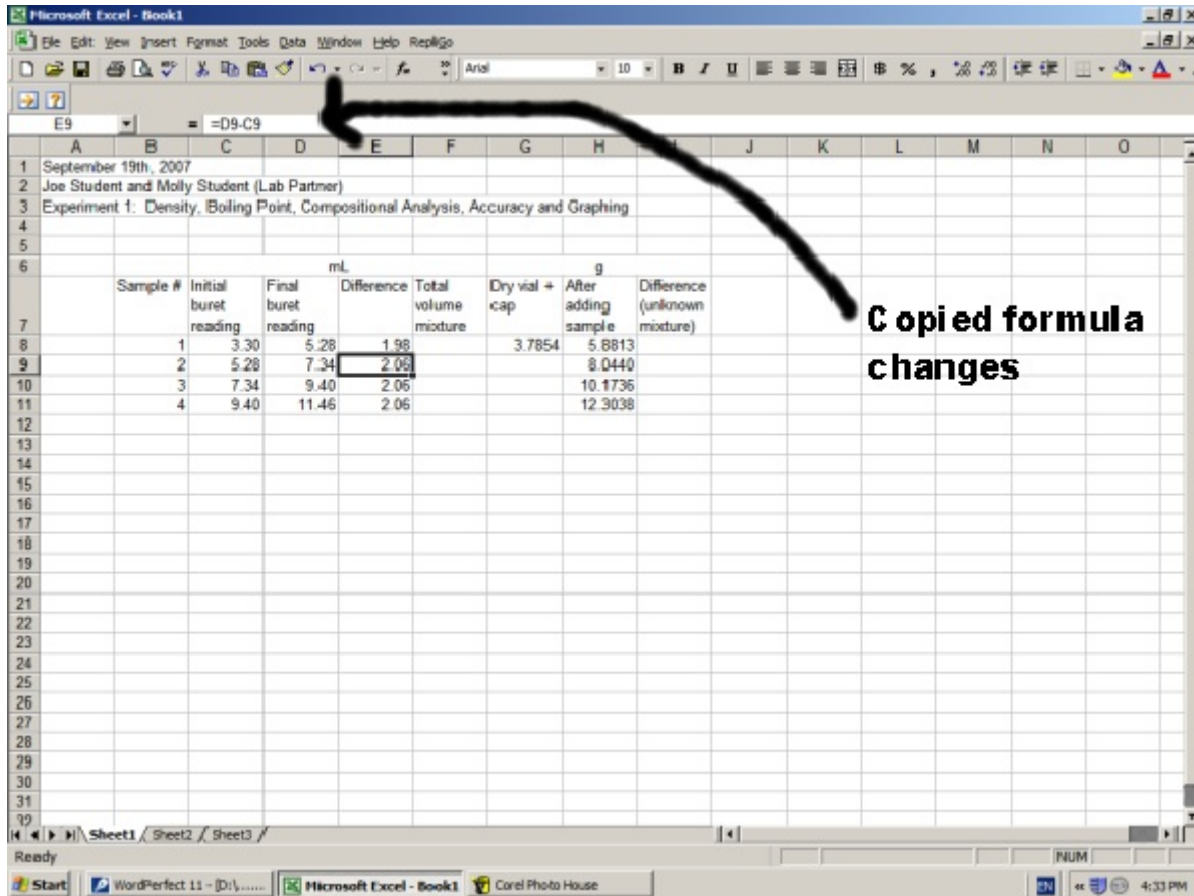
This is a good thing. Just imagine if you had 100 data points. With a few mouse clicks, you could calculate all the values.

17. To add up the total values, we can enter the following code in F8

        =E8

    This will take the value of E8 and place it in F8 (since the value is the same for the first data point.)

18. The value in F9 is the total mL, which is the addition of F8 plus the "Difference" in Sample 2. We can get the spreadsheet to add these values together by putting the following code in

    =F8+E9

19. If we copy the contents of F9 (Ctrl+c) and paste them (Ctrl+v) into F10 and F11, the spreadsheet will calculate the totals. Notice again how the formula changes from F10 to F11.

** Note that if you make a mistake, you can click on the cell and hit the Delete button on the keyboard to erase the contents of that cell.

20. To calculate the "*Difference (Unknown Mixture)*", we want to subtract the "*Mass after adding sample*" from the "*Mass of the Dry vial and cap*". We can do this by entering the code in I8

        =H8-G8

The $ locks the values when we copy and paste.

If we copy the code of I8 to I9, I10 and I11. The code will read:

        I9:   =H9-G8
        I10:   =H10-G8
        I11:   =H11-G8

If we did not use the $, the code would read

        I9:   =H9-G9
        I10:   =H10-G10
        I11:   =H11-G11

        This would be wrong since we have no values in G9 to G11
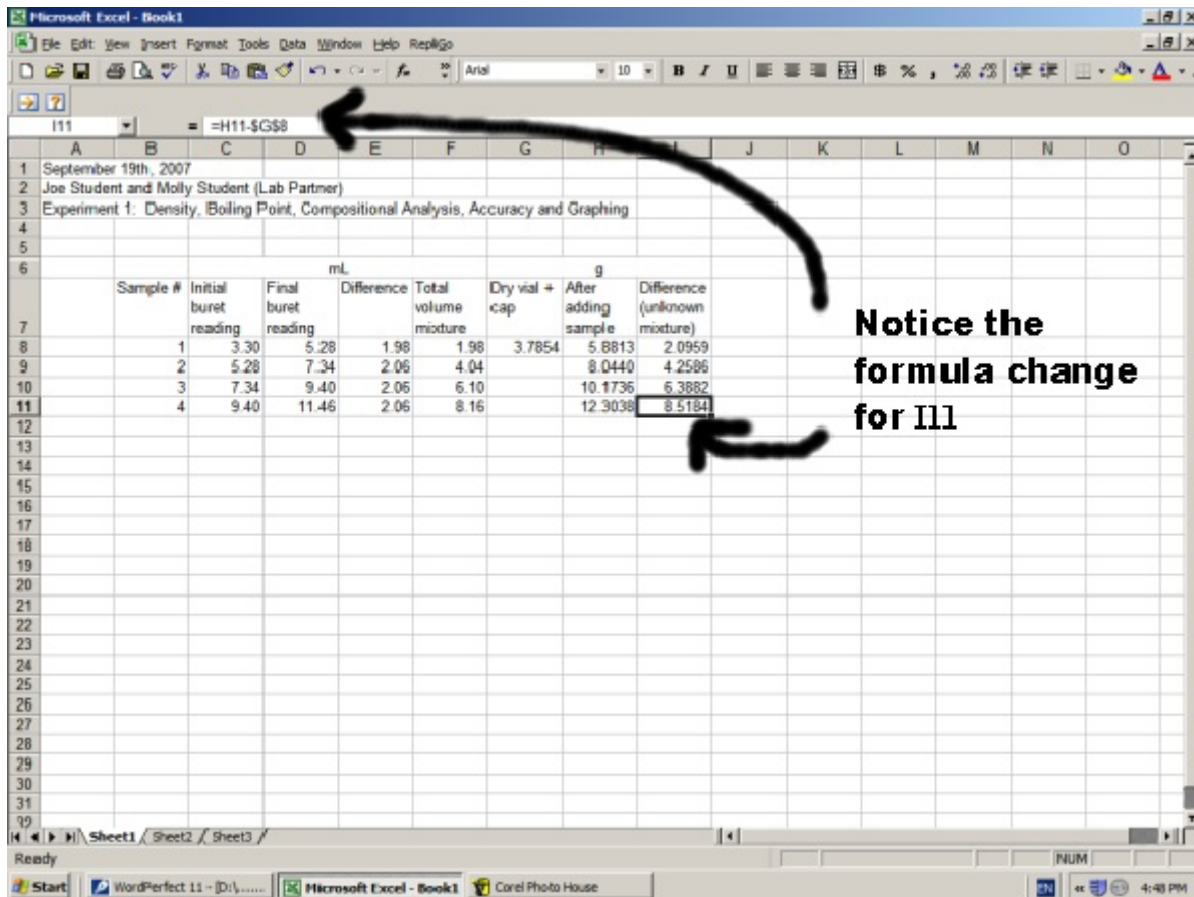
21. To set up an X,Y graph of "Mass vs Volume", click on "Insert" and then "Chart" at the top.
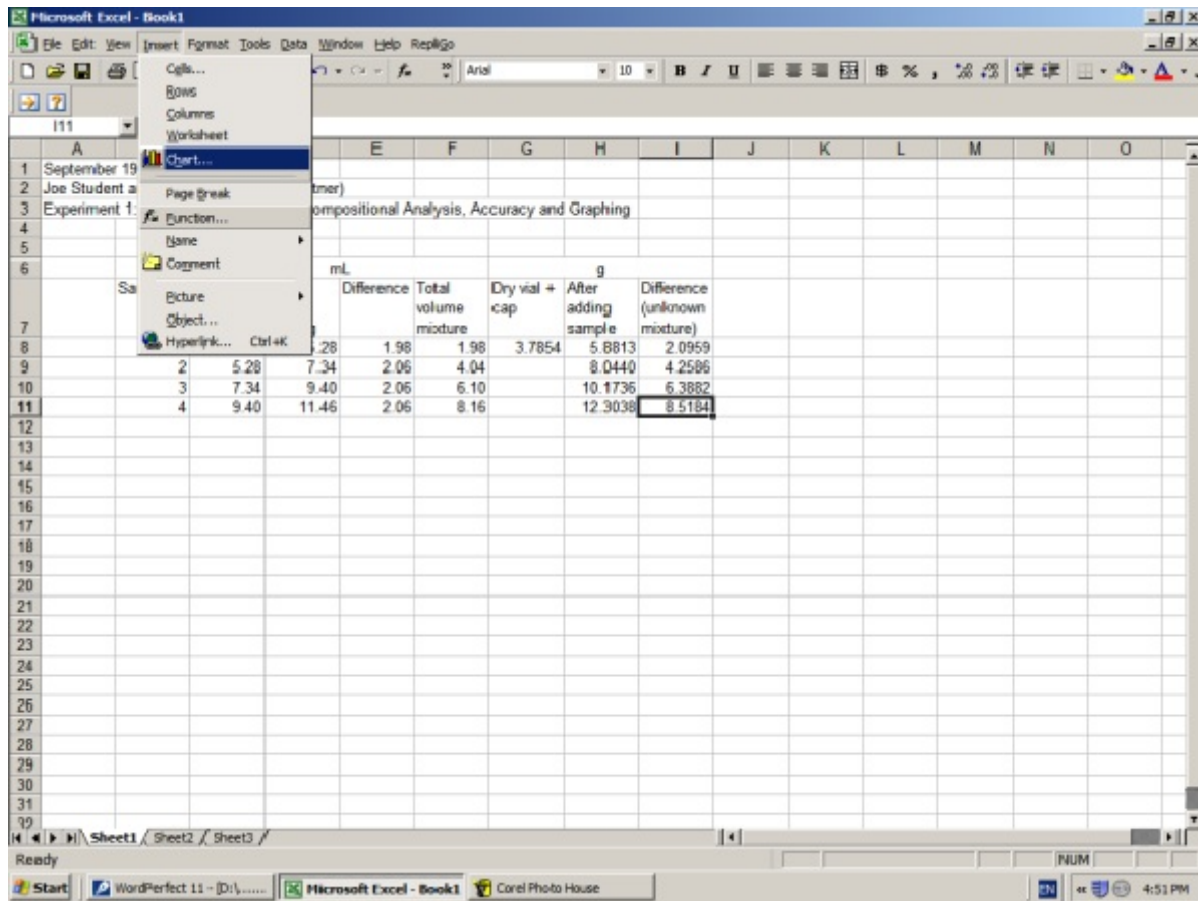
22. Select "XY (scatter), then click on the NEXT button.

> If you want the computer to connect your points with lines, it gives you options on the right (Chart sub-types). We will leave the box with only the data points showing, highlighted.
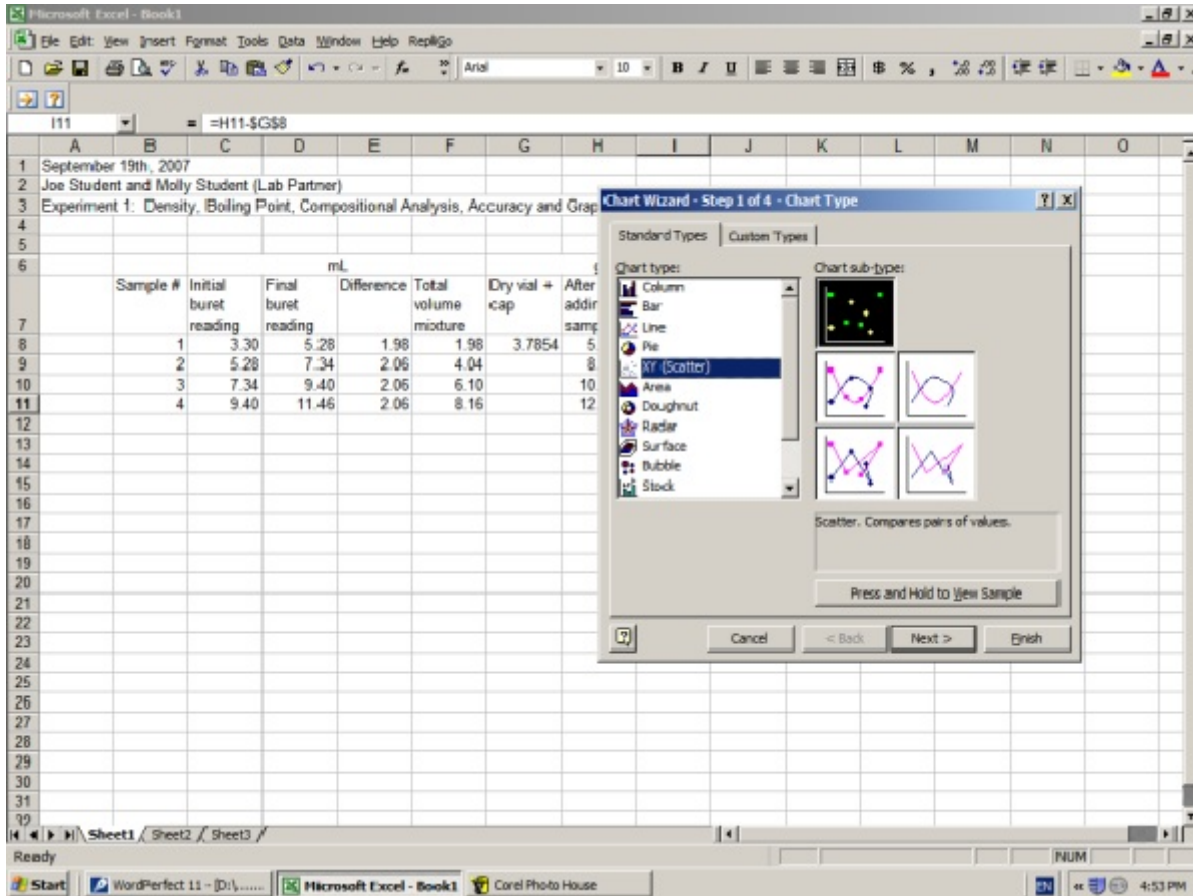
23. In the next pane of the chart window, click on the "series" tab.

Many computers behave differently at this point. You may notice Series 1 to 4 are in the "Series" box. You may see nothing in the "Series" box.

Since we want only one line, we want it to only have the number "1" in the Series box. That gives us the following two options:

1. **Removing a Series:** To remove a Series, click on the Series in the "Series Box" (such as the number "2") so that it is highlighted and then click the Remove button. This will get rid of that series. Remove the other "series" until the box only contains "Series 1"

2. **Adding a Series:** If there is nothing in the Series box, then click on the Add button so that it contains "Series 1"
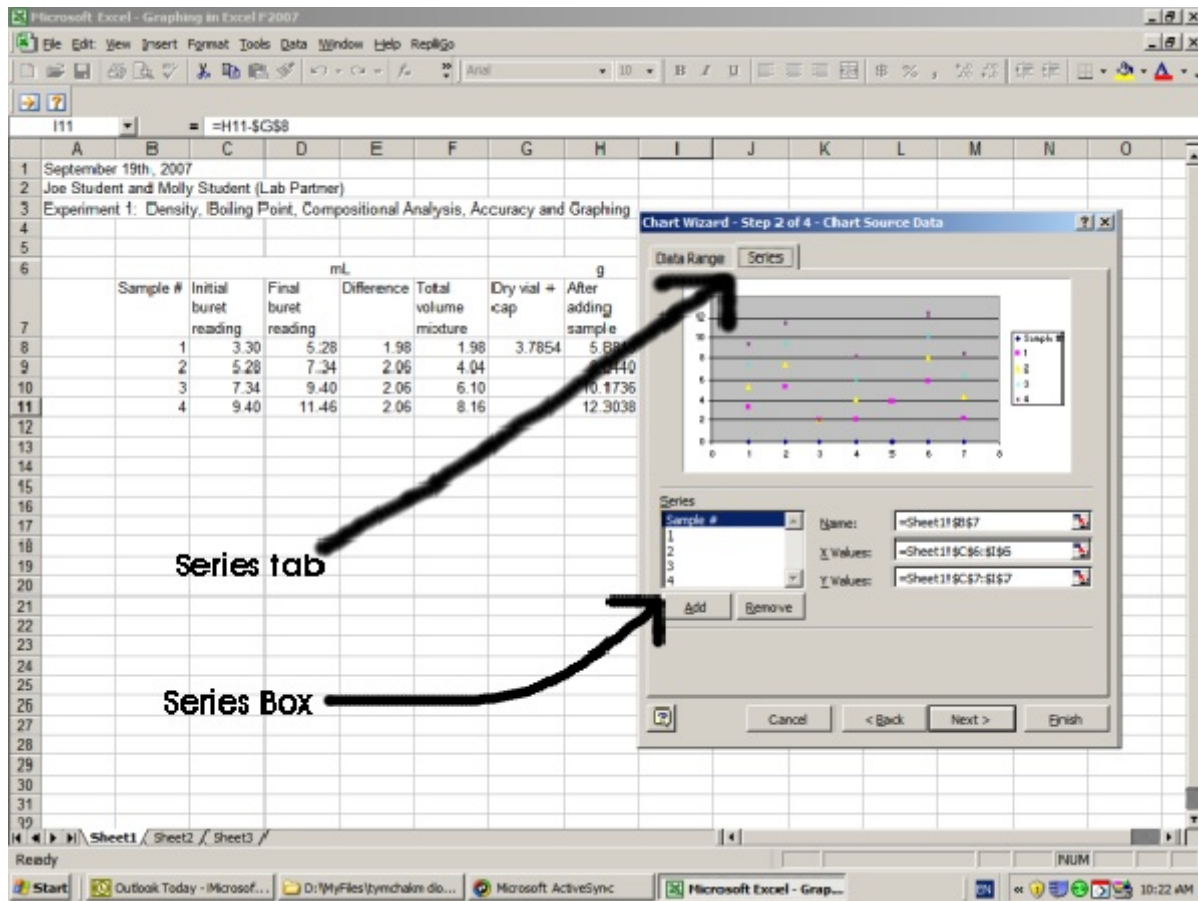
24. We want our "Mass" values to be on the Y axis. To do this click on the square with the red arrow in the "Y Values" box.
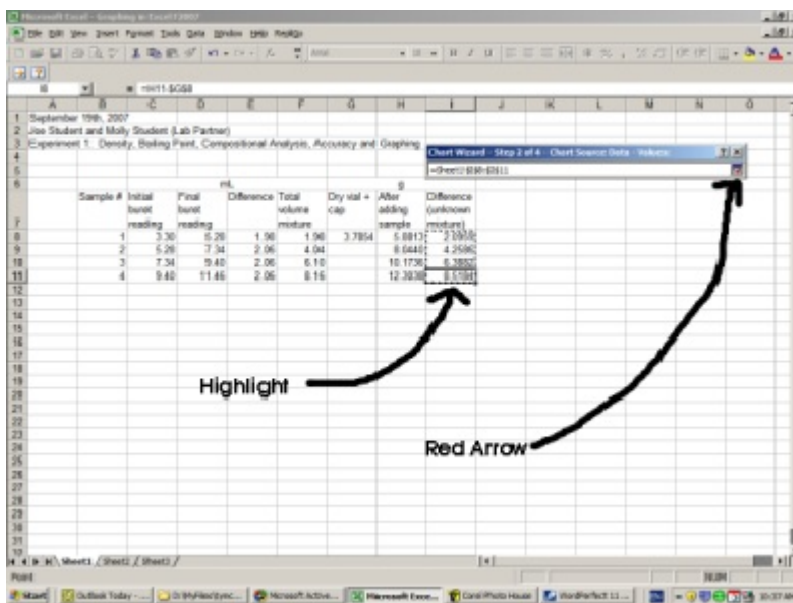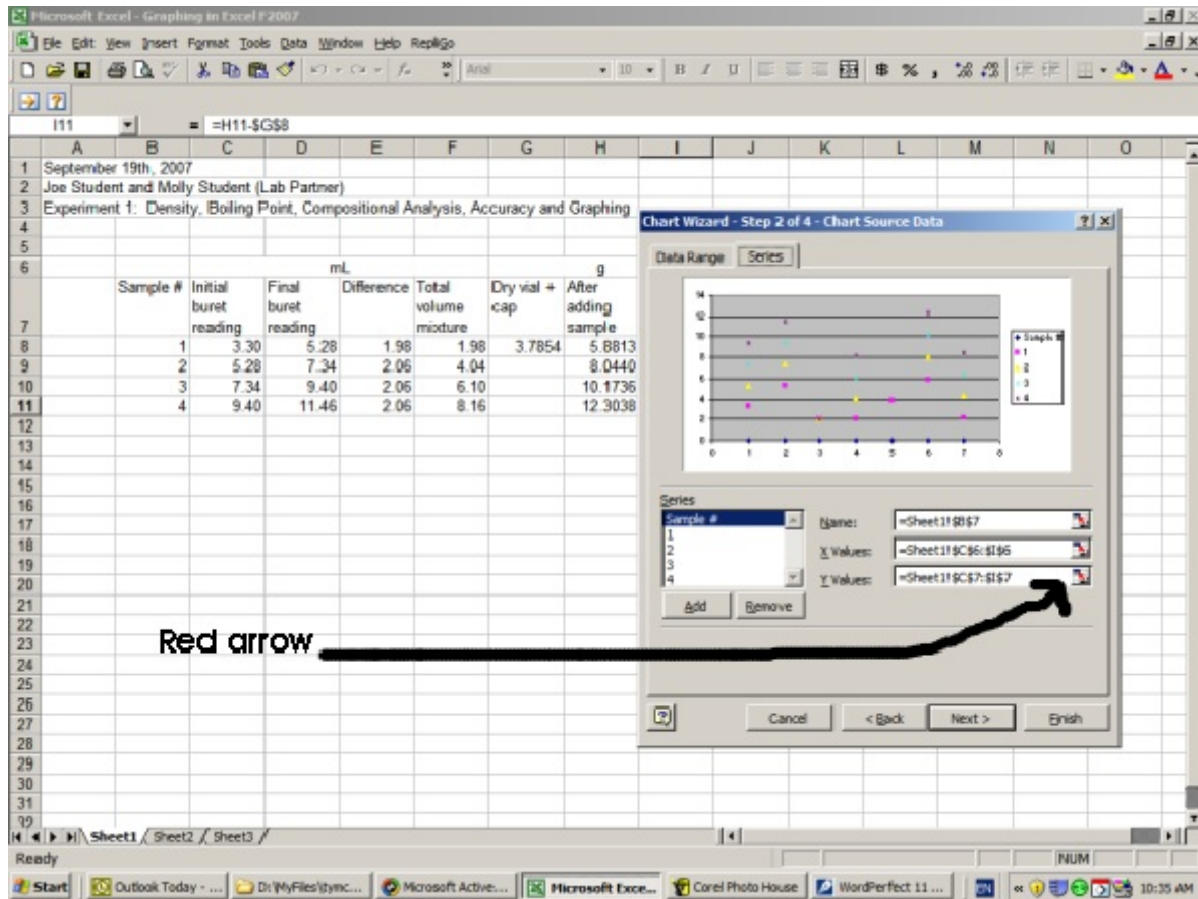
Highlight the values I8 to I11, then click the red arrow box in the small "Source Data - Values" window.

This assigns the Mass values in I8 to I11, to our Y values. (Also known as Dependent Values)

**Possible errors at this point explained on next page.

25. Occasionally an error occurs because the computer adds old values with new values. If this occurs, delete the numbers and letters in the "Y values" box and try again at step 24 . If everything is OK, then continue on.

Now click on the red arrow box, of the "X Values:" box and highlight F8 to F11. If the "Source Data - X Values" window is in the way, you can click on the window and drag it aside.

This assigns the values F8 to F11 to the X values (or independent values).
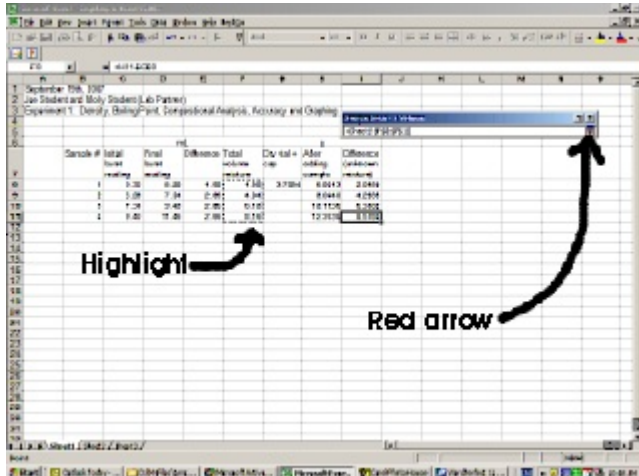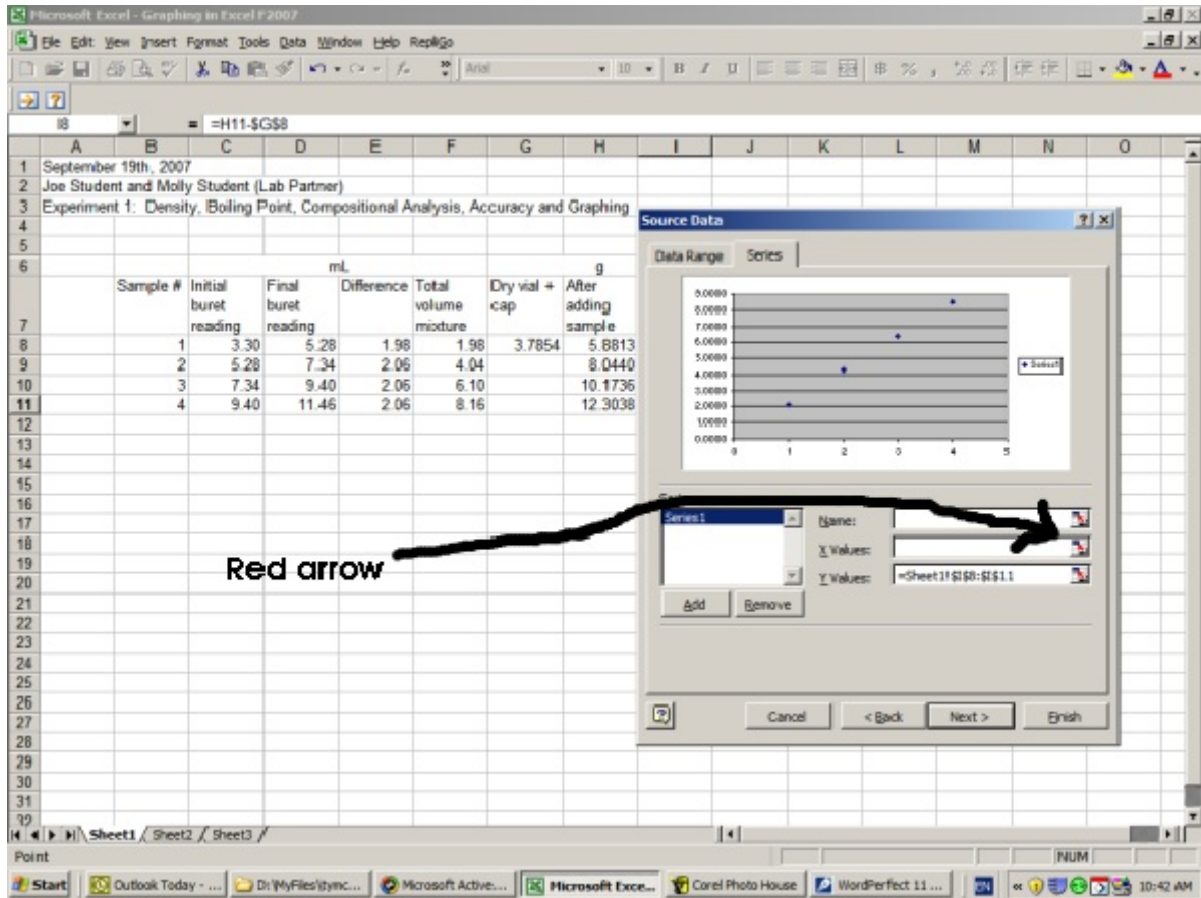
Now click the red arrow box in the small "Source Data - X Values" window.

Then click on the NEXT button.

26. Enter a title for the graph, and titles for the "X Axis" and "Y Axis".   The main chart title needs to be descriptive. It should NOT just be "Mass vs Volume".

For the Axis titles (labels), you should include units.

Then click NEXT

27. We will place the graph as an object in this spreadsheet, so click the circle next to "As object in:", then click on Finish

28. To arrange the data and graph for printing, Click on the "View" option at the top, and then on "Page break preview".
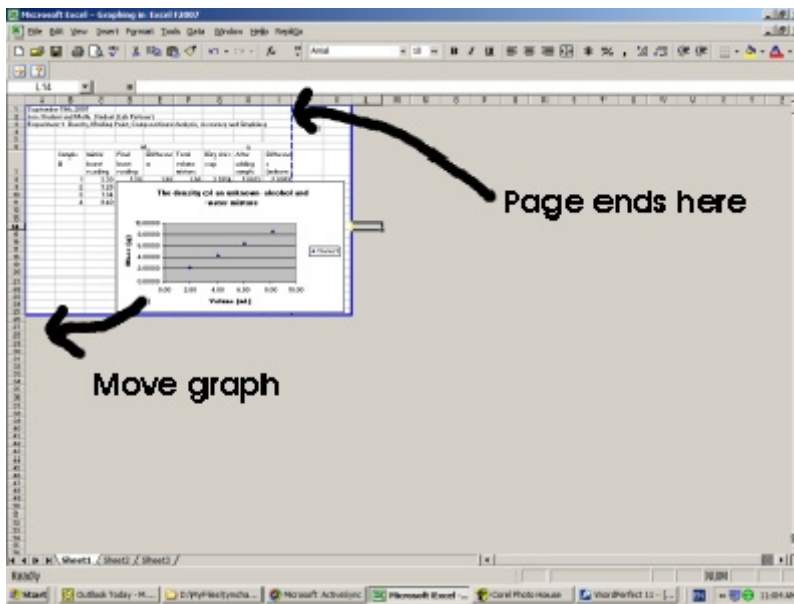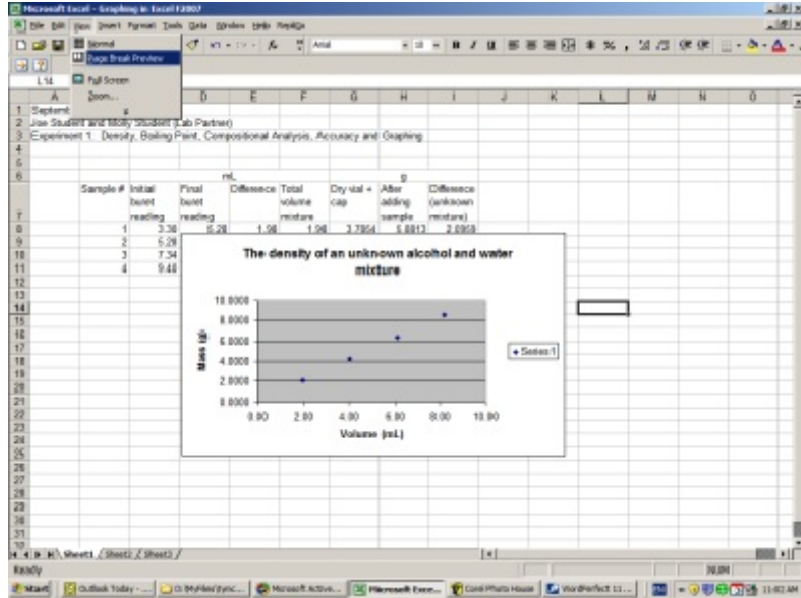

This will show you a different view. The dashed blue line is where the page ends. This blue line can be adjusted by dragging it.

Page ends here

Move graph

Click on the chart so that it is highlighted with boxes around it, then drag the chart so that it does not cover the data and still remains on the page.

Adjust the graph size so that it is fairly large but will still remain on a single page. When you click on the graph, boxes appear at each corner and at the middle of the sides. Use these boxes to adjust the size of your graph.


Adjust graph size with corner boxes
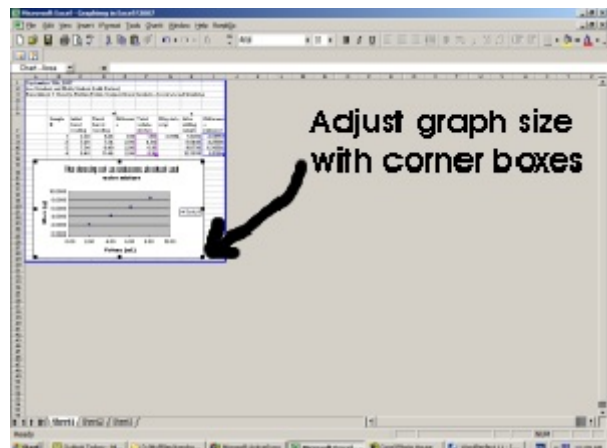
29. Let's now return back to a "Normal" view. Click off the graph, then click on "View" , then on "Normal"
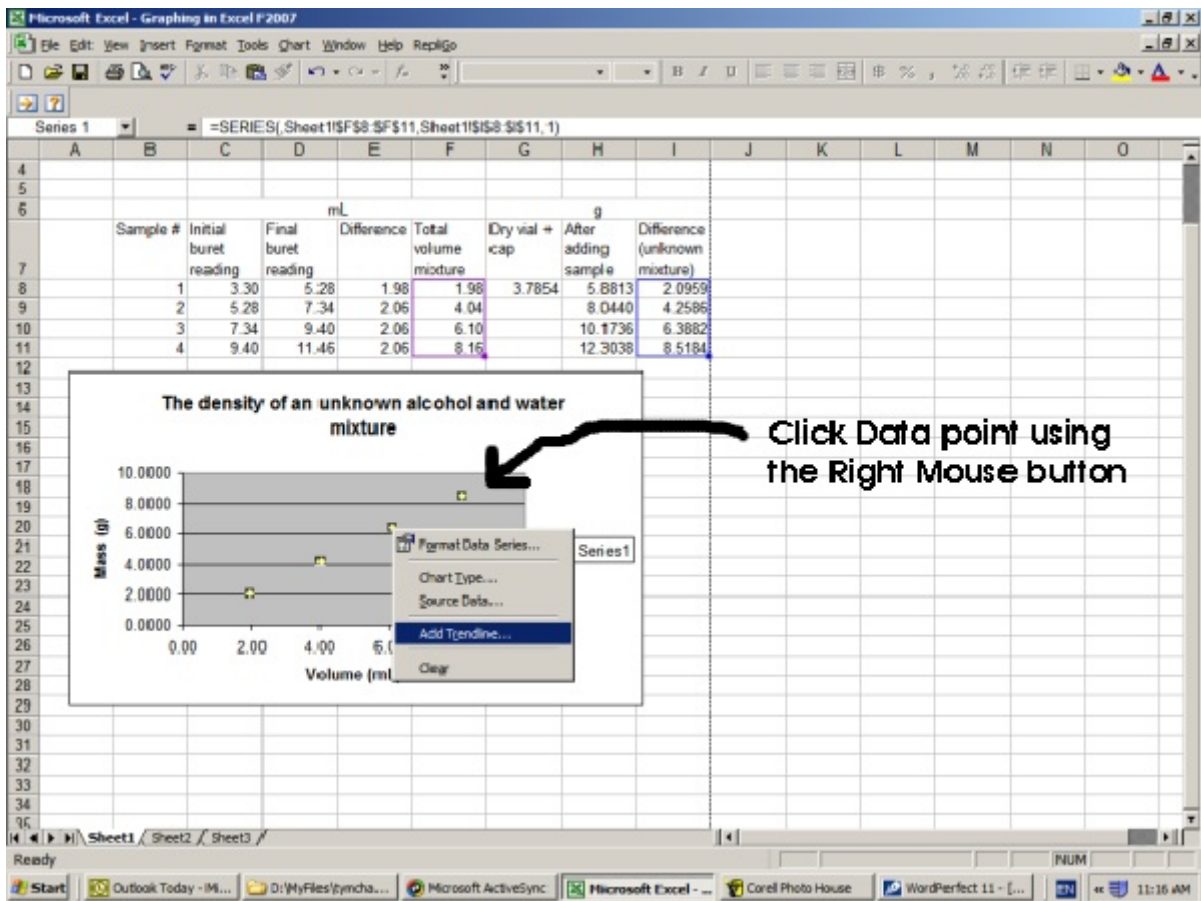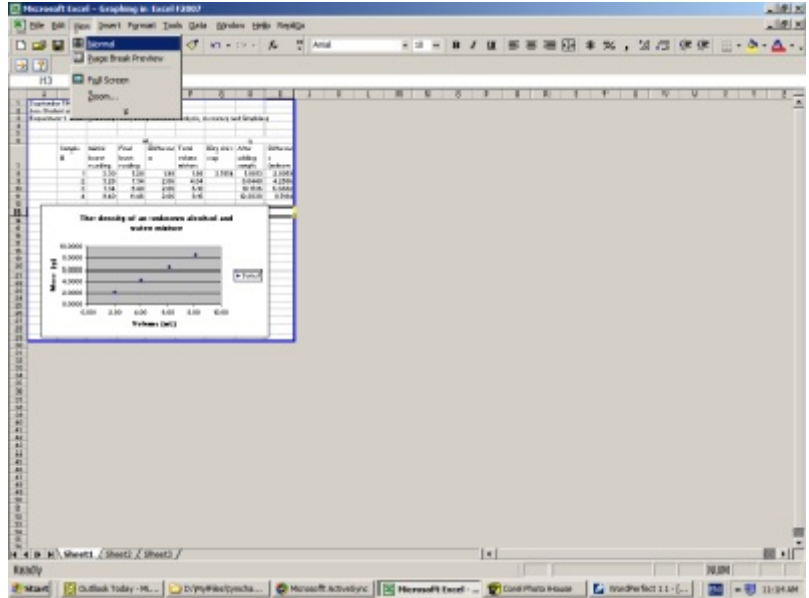
To place a best fit line on the chart which includes the equation of the line and the R^2 value. Right click on the data points of the chart so that they are highlighted, then click on "Add Trend line"

30. Click on the "Linear" box of the "Trends/Regression type", then click on "Options."
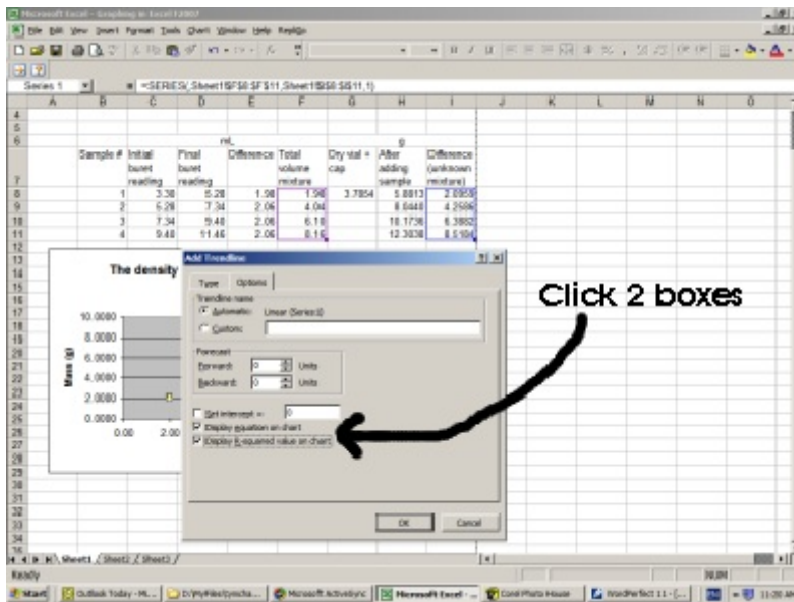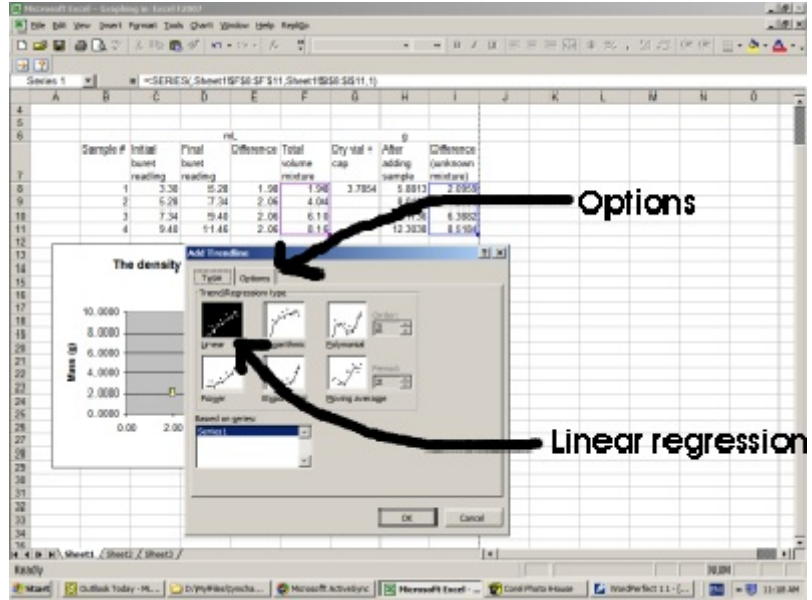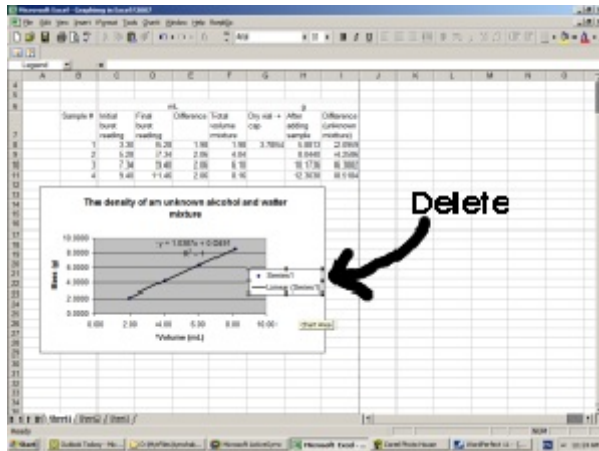

Click the box which says "Display equation on the chart"

Click the box which says "Display R-squared value on the chart"

Then click, OK.

Now we can adjust the page so it looks nice. How you do this is up to you.

A. You may want to get rid of the legend (Which has the box that says Series 1 and Linear (Series 1), by clicking on it and pushing the *Delete* button.

B. If you don't like where the equation is, click on the equation and drag it somewhere on the graph.

C. If you don't like the look of the background (grey in this example) you may change this by right clicking on the plot area, then clicking the "Format Plot Area".

The color may be adjusted by clicking one of the colors under "Area", in this case we will change it to white. Then click "OK"
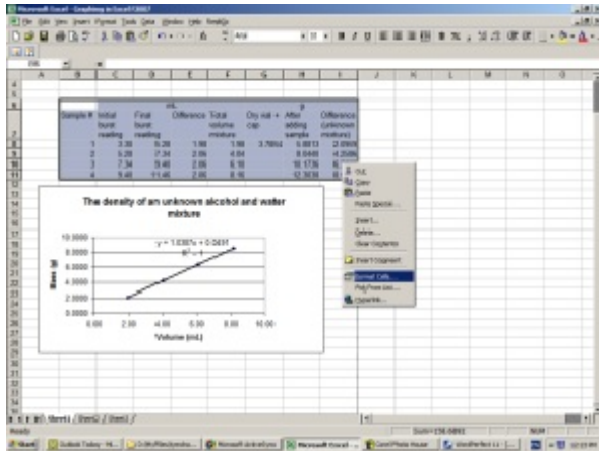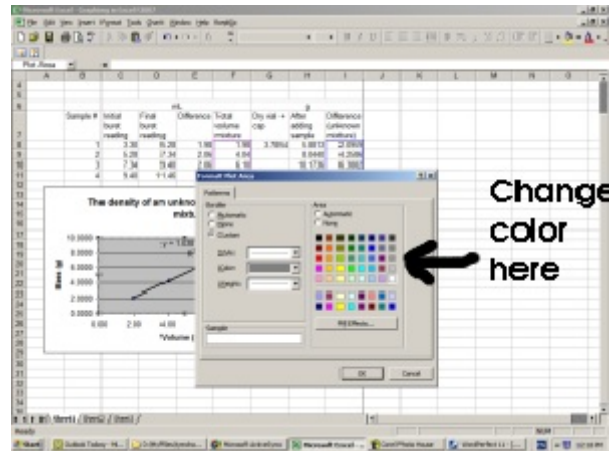
D. If you want to add borders to your data, highlight B6 to I11 and then right click the highlighted area. Choose "Format Cells"
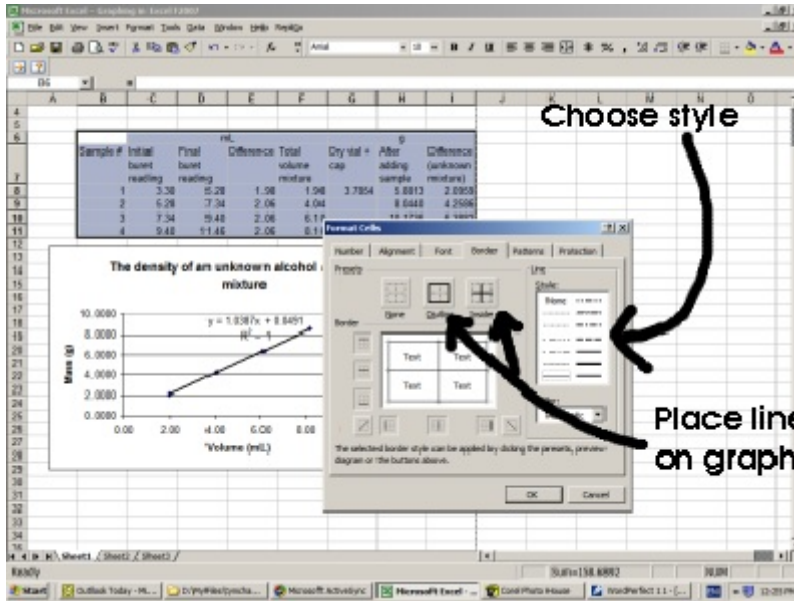
Add borders by clicking the "Border" tab at the top.

Choose a line style and then click on "Outline" and "Inside". This will place lines on your graph.

31. We are now ready to print. You may want to go back to the "Page Break Preview" (Step 28) to make sure everything fits on one page.

Make sure that you click on a cell on the spreadsheet (Don't have the graph highlighted.), then click on "File" and then "Print"

In the "page break preview" view, I have moved the dashed line to fit the data
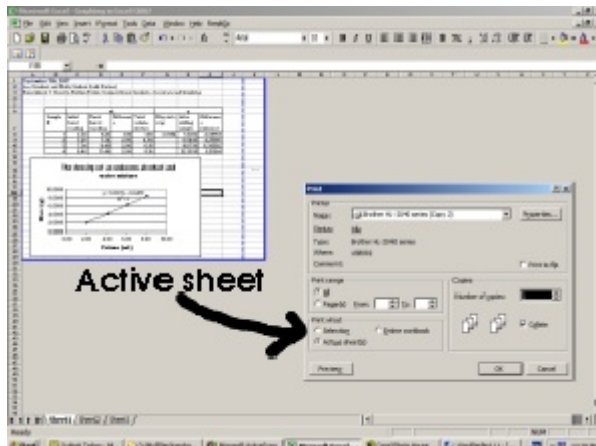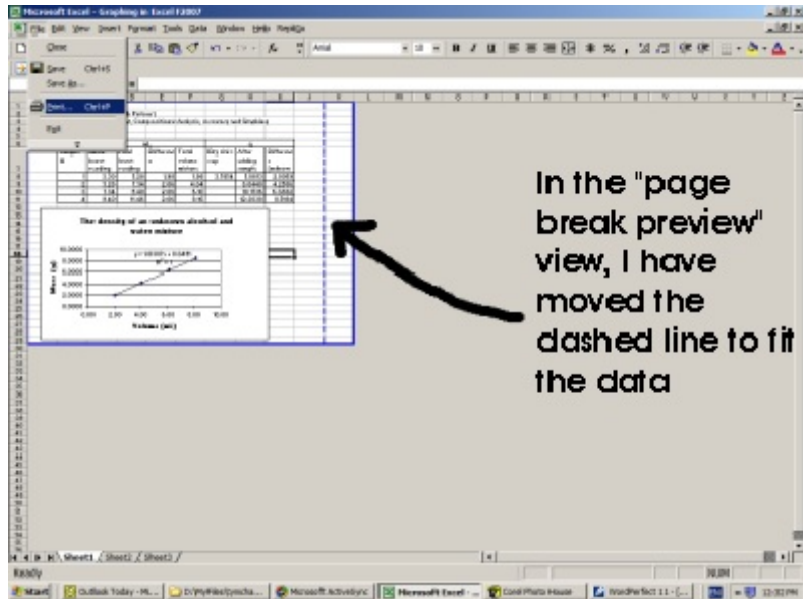
Select "Active sheet" and then "OK"

The document should print.