This example is based on an older version of this lab. It is intended to help with seeing how to do certain things using Excel, particularly getting more than one data set on a graph. It was also using a much older version of Excel. The final graph should have 7 data points, 5 T/V points and two boiling points, the normal boiling pt. (found in the CRC) and the experimental b.p. determined in lab. Your new tables will look a little different than the ones in this examples since there are now lines for three experimental b.p. determinations and then a line for the average exp. b.p. There's also a line for the normal b.p. See the last page of this file for an example of the finished graph. This was original done when the experiment was called exp 13 (it's now exp 14).

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8		T (°C)	T (K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)								
9		42.0	315.2	0.003173											
10		67.0	340.2												
11		72.5	345.7												
12		81.0	354.2												
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6		T <sub>R</sub> (°C)	25.9			V <sub>R</sub> (mL)	5.0		P <sub>P</sub> (mm Ha)	744.6		 	<u></u>				
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8		T (°C)	T (K)	1/T (K*	1)	V (ml)	Ps (mm H	g)	In(Ps)								
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7		<sup>1</sup> R(♥)			YR	(IIIC)			r B (min rig)	744.0							
8		T (°C)	T (K)	1/T (K <sup>-1</sup> )	1	/ (ml)	Ps (mn	n Hg)	In(Ps)								
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8		T (°C)	T (K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)								
9		42.0	315.2	0.003173											
10		67.0	340.2	0.002940											
11		72.5	345.7	0.002893											
12		81.0	354.2	0.002824											
13		86.0	359.2	0.002784											
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7		<sup>TR</sup> (♥)	20.0		*R (IIIE)	0.0	г в (mm rig)	744.0							
8		T (°C)	T (K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(P <sub>s</sub> )								
9		42.0	315.2	0.003173											
10		67.0	340.2	0.002940											
11		72.5	345.7	0.002893											
12		81.0	354.2	0.002824											
13		86.0	359.2	0.002784											
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14	Point	97.4	570.0	0.002099		700.0	0.0555								
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Continue in this way. Program eqn 6 from the lab manual into the column for Ps and then take ln(P) for the next column (enter "=ln(f9)") and then copy this formula into the remaining cells. The "finished" sheet for cmpd 1 is below

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6		To (°C)	25.9		Va (ml.)	5.0	Pa (mm Ha)	744.6					2	-	
7		·K ( ~)			YK (IIIE)		(	144.0						-	
8		T (°C)	T(K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)							-	
9		42.0	315.2	0.003173	6.0	9.1E+01	4.51								
10		67.0	340.2	0.002940	8.0	2.2E+02	5.37								
11		72.5	345.7	0.002893	10.0	3.1E+02	5.75								
12		81.0	354.2	0.002824	12.0	3.8E+02	5.93								
13		86.0	359.2	0.002784	14.0	4.3E+02	6.05								
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4	Known c	ompouna: Ze	elimerinium	1	I, Vol data i	obtained from: J	oe Somebody	·							
6		T <sub>R</sub> (°C)	25.9		V <sub>R</sub> (mL)	5.0	P <sub>B</sub> (mm Hg)	744.6							
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8		T(°C)	T(K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)								
9		42.0	315.2	0.003173	6.0	9.1E+01	4.51								
10		67.0	340.2	0.002940	8.0	2.2E+02	5.37								
11		72.5	345.7	0.002893	10.0	3.1E+02	5.75								
12		81.0	354.2	0.002824	12.0	3.8E+02	5.93								
13		86.0	359.2	0.002784	14.0	4.3E+02	6.05								
14	Boiling Point	07 /	370.6			760.0	6 6333								
15	Foint	57.4	570.0	0.002033		700.0	0.0000								_
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Then copy this sheet to a new sheet for the data for compound 2. "Right click" on the tab and choose "Move or Copy".

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5														2	
6		T <sub>R</sub> (°C)	25.9		V <sub>R</sub> (mL)	5.0	P <sub>8</sub> (mm Hg)	744.6							
7				4 1 -											
8		T(°C)	T (K)	1/T (K*')	V (ml)	Ps (mm Hg)	In(P <sub>s</sub> )								
9		42.0	315.2	0.003173	6.0	9.1E+01	4.51								
10		67.0	340.2	0.002940	8.0	2.2E+02	5.37								
11		72.5	5 345.7	0.002893	10.0	3.1E+02	5.75								_
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8		T(°C)	T (K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)								
9		42.0	315.2	0.003173	6.0	9.1E+01	4.51								
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11		72.5	345.7	0.002893	10.0	3.1E+02	5.75								
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Now go in and start changing the temp and volume. You will notice the data in the other columns starts changing automatically because the equations are the same as for the first compound (the room temp and volume and barometric pressure values may be a little different from each of you so those would have to be changed in the equation for Ps). Change 42.0 to 36.5 for the temp and change the volume from 6.0 to 6.2. Note the other changes that take place.

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8		T (°C)	T (K)	1/T (K <sup>-1</sup> )	V (ml)	Ps (mm Hg)	In(Ps)								
9		42.0	315.2	0.003173	6.0	9.1E+01	4.51								
10		67.0	340.2	0.002940	8.0	2.2E+02	5.37								
11		72.5	345.7	0.002893	10.0	3.1E+02	5.75								
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11		72.5	345.7	0.002893	10.0	3 1E+02	5.75								
12		81.0	354.2	0.002824	12.0	12.0 3.8E+02									
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Do the same for the other temp and volumes for this compound. Then do the 3<sup>rd</sup> compound.

I'm including a sample graph for you to get an idea of what it should look like. Your graph should be as a separate chart so it takes up a whole page. It will give a better idea of what it will look like on the page. The graphs are on the next pages.

To do a graph highlight the 'x' values, 1/T. Then hold the control key and highlight the 'y' values, ln(P). Then click on the "chart wizard" icon at the top. Then choose scatter graph with no connecting lines and go through the next few screens. Save it as a 'Chart' in a new sheet. Then change the grey background to white (it's easier to see the points and won't waste a lot of your printer ink) right clicking in the chart area and then clicking on "Format Plot Area" in the pop-up box and then choose "none" for the 'area' on the right-hand side.

Then change the scale of the y-axis to get rid of the empty space at the bottom of the graph (right click on the y-axis). You can wait to do this until you've put all 3 knowns on the graph. You don't want a lot of empty useless space on your graph (i.e. your points should occupy most of the plot area).

Then right click on a data point and a new menu box opens from which you can choose 'add trendline'. Choose 'linear'. Then click on the 'options' tab and click in the boxes to print the equation and  $R^2$  value.

Don't forget to include a title for the graph and labels for the axes (including units). The y-axis, ln(P), doesn't technically have units. However, you can put the following, "ln(P) (P in torr)", using the what ever units you used for P.

You can change the font sizes for the labels of the tick marks (grid lines) by clicking on the appropriate axis. You can do the same for the graph and axis titles by clicking on the titles.

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How do you add other data? The next few slides show this.

Right click in the plot area. Then click on "Source Data" or "Select Data". Click on the "Series" tab. Click on "Add" button. You can change the title of your series by typing a name in the "Name" box. Then click on the little "spreadsheet" icon for "X Values". Then go to the "sheet" which contains the data you want to plot and highlight the x values (1/T) and hit 'enter'. Do the same for the "Y Values".

You can get rid of the part of the legend that shows the line by highlighting it in the legend and pushing the 'delete' key. It's not needed if the points used for each set of data use different symbols (which is the default).

Then do the trend line for the new data.

Repeat for the  $3^{rd}$  set of data.

Do not attempt to change the 1/T axis (x-axis) to 1/T \* 1000 (as was on the overhead in class). This will cause a problem with the slope reported by Excel. Just leave the numbers on the x-axis as I've shown them.







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10		62.9	336.1	0.002976	11.1	3.7E+02	5.91								
11		69.1	342.3	0.002922	16.3	4.8E+02	6.18								
12		72.8	346.0	0.002891	21.0	5.4E+02	6.29								
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Delete the part of the legend for the line. Click on the legend and then on the line description and press the delete key.



Add labels for the boiling points. You MUST include the normal and experimental b.p. and have these points labeled as such. You can use the "Insert" tab in Excel and insert a text box for these labels.



The following is a finished graph with all three compounds (using a different set of data then in the previous examples). This gives an idea of what it should look like. It would take up the whole page w/o this paragraph. Set page margins to zero inches (if Excel complains ignore it). See the "Laboratory" link for a better example of this graph.

