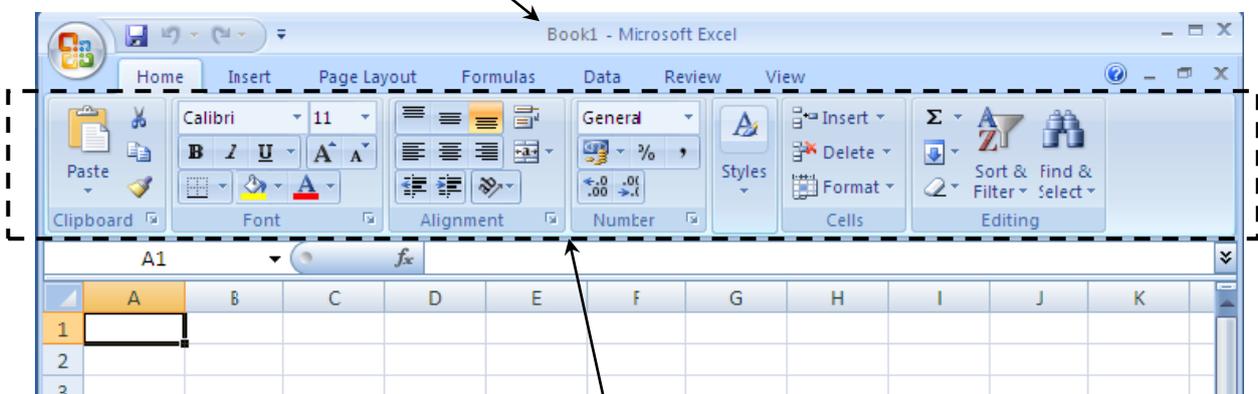


Graphs of Functions in Excel

This activity will show you how to draw graphs of algebraic functions in Excel.

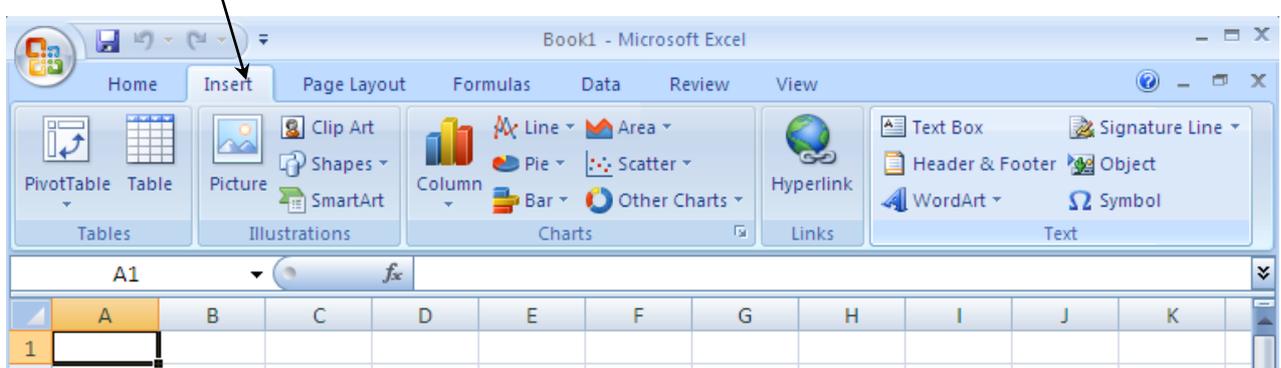
- Open a new **Excel** workbook.



This is Excel in Office 2007. You may not have used this version before but it is very much the same as previous versions, you just have to hunt for the function you want.

Rather than toolbars, this version uses the **RIBBON** to access the various functions and affects you need. The various icons show what clicking on each button will do. Rolling the mouse pointer over a button will often show what would happen if you were to click it.

This is the **Insert** tab from the ribbon.

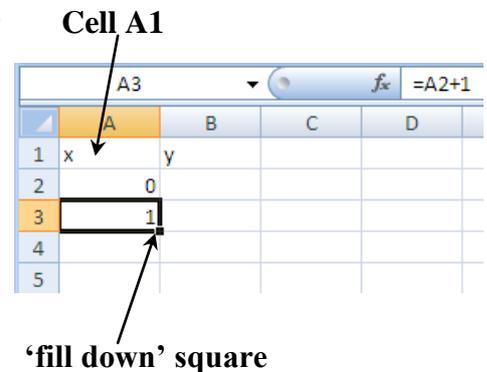


To draw the graph of $y = 3x - 2$ in Excel

- First you need to **draw up a table of values** for x and y .
 Left click on **cell A1** and **type x** – the heading for column A.
 Left click on **cell B1** and **type y** – the heading for column B.

x values

- To obtain whole numbers from 0 to 10 in column A:
 Left click on **cell A2** and **enter the value 0**
 Left click on **cell A3** and **enter the Excel formula $=A2+1$**
 Excel will put the value 1 in cell A3 as shown.



Now look for the little black 'fill down' square at the bottom of the right-hand side of cell A3.

- Move the mouse until the cursor (cross) is on this square then **left click** and **at the same time drag the mouse** so that the cursor moves down column A.
 Release the mouse button when you reach cell A12.

You should find that Excel enters values from 2 to 10 in cells A4 to A12.

Fill down copies the formula from A3 into the other cells, in each case increasing the cell reference by 1, so that each value entered is one more than the last.

y values

- Now enter the Excel formula $=3*A2-2$ in cell B2.

This tells Excel to multiply the value in cell A2 by 3 then subtract 2

Excel will work out the value of $3 \times 0 - 2$ and put the result (i.e. -2) in cell B2.

- Use **fill down** to copy the formula into **cells B3 to B12**.

The values and formulae in the cells will now be as shown here.

You can check the formulae if you wish by left clicking on each cell – the formula will appear in the box above the column headings.

	A	B		A	B
1	x	y	1	x	y
2		0	2	0	$=3*A2-2$
3		1	3	$=A2+1$	$=3*A3-2$
4		2	4	$=A3+1$	$=3*A4-2$
5		3	5	$=A4+1$	$=3*A5-2$
6		4	6	$=A5+1$	$=3*A6-2$
7		5	7	$=A6+1$	$=3*A7-2$
8		6	8	$=A7+1$	$=3*A8-2$
9		7	9	$=A8+1$	$=3*A9-2$
10		8	10	$=A9+1$	$=3*A10-2$
11		9	11	$=A10+1$	$=3*A11-2$
12		10	12	$=A11+1$	$=3*A12-2$



Now draw the graph as follows:

- Select the values in columns A and B by left clicking on cell A1 and then dragging the mouse until the cells are highlighted as shown.
- Now left click on the Insert tab of the ribbon to be able to insert a graph

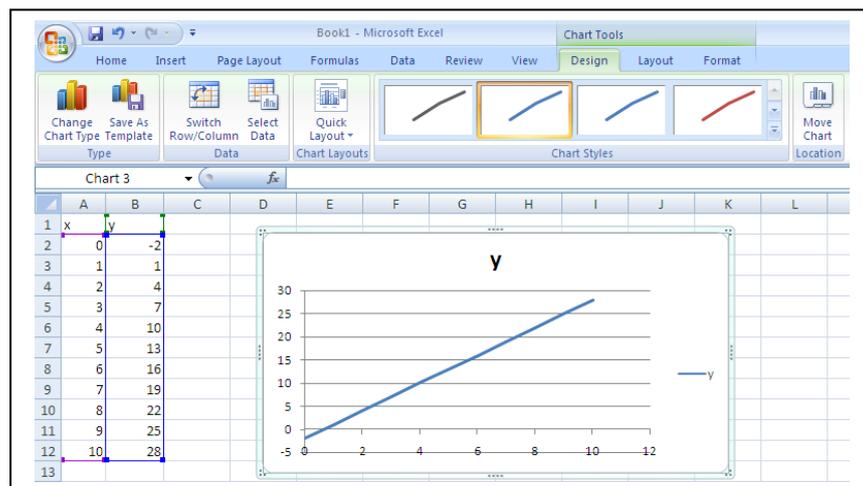
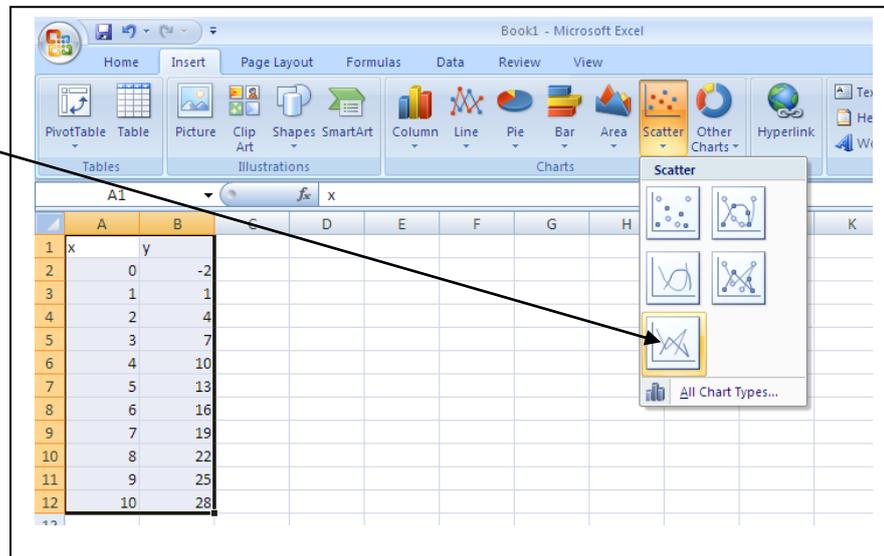
	A	B
1	x	y
2	0	-2
3	1	1
4	2	4
5	3	7
6	4	10
7	5	13
8	6	16
9	7	19
10	8	22
11	9	25
12	10	28
13		

Left click on **Scatter** and then left click the **last graph** to give a scatter graph with straight lines.

The required graph will appear in your spreadsheet. You can re-size the graph by dragging the dotted parts at the corners or sides or move it by dragging the whole graph.

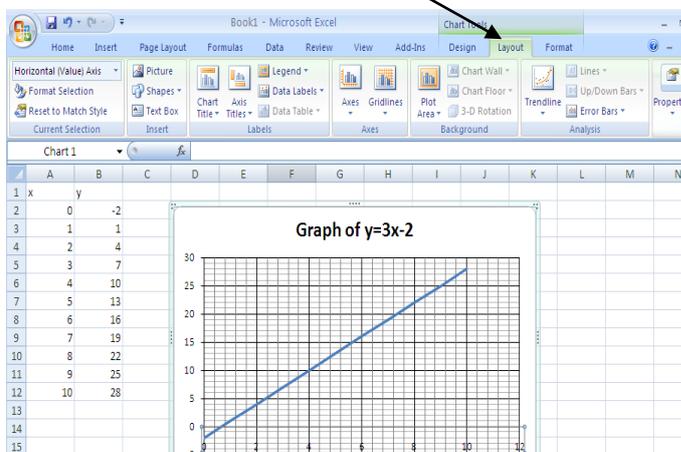
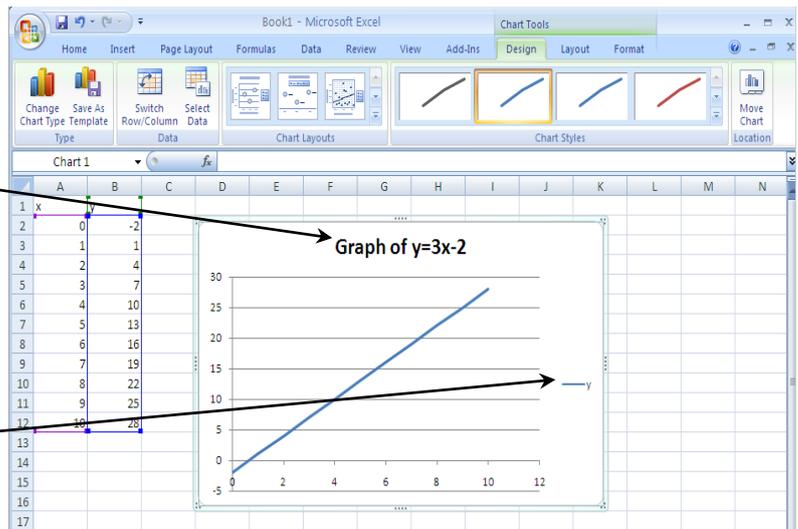
Notice that the ribbon has switched to the *chart tools*.

To access the *chart tools* at any time you must click on the chart



Edit the title of your graph as shown.

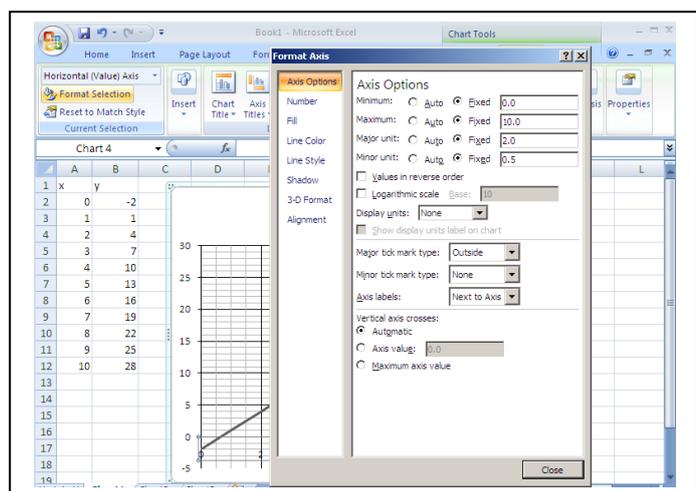
From *Chart tools, Layout, Legend* on the ribbon, select none to remove the legend on the right. (not necessary when there is only one line on the graph.)



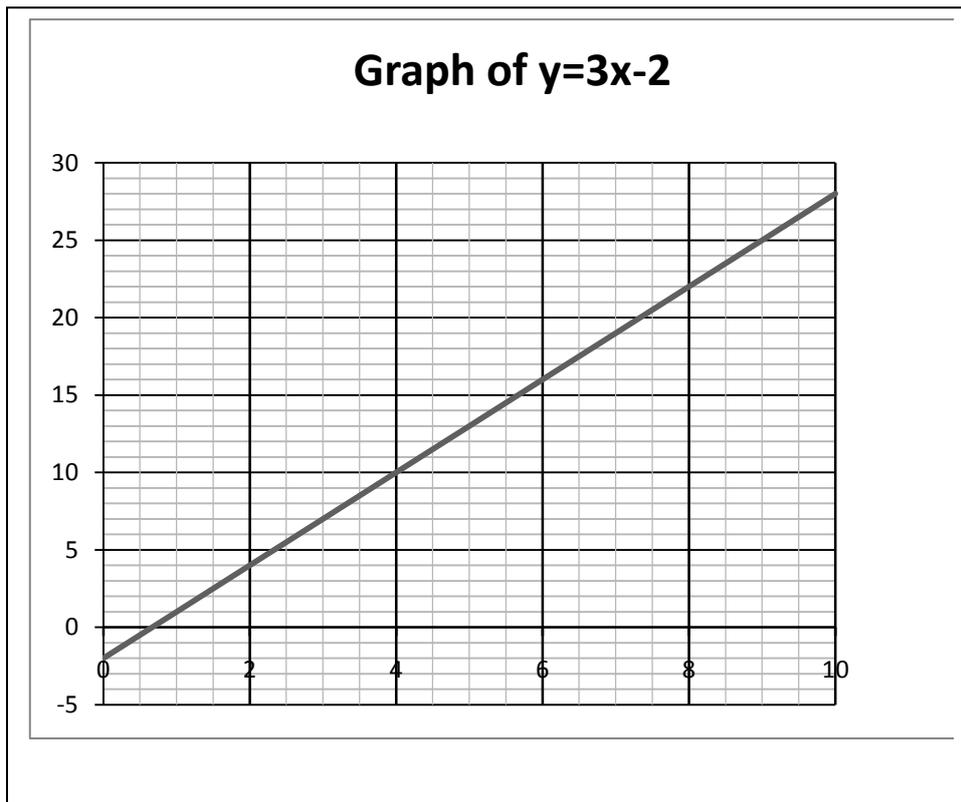
Now change the gridlines to make it look like a real graph. From *Chart tools, Layout, Gridlines*, select Primary horizontal gridlines then major and minor gridlines from the options. Do the same for the vertical gridlines.

You can change the appearance of the gridlines by selecting *Chart tools, Layout, Gridlines, Primary horizontal gridlines, More primary horizontal gridlines options*. You can change the colour from automatic to a solid line in black. Do the same for the vertical gridlines and then repeat for the horizontal and vertical axes.

You can also use this method to change the scales on the axes. Use *axis options* to change from auto to a fixed scale ending at 10 with a minor unit of 0.5



Your graph should now look something like this:



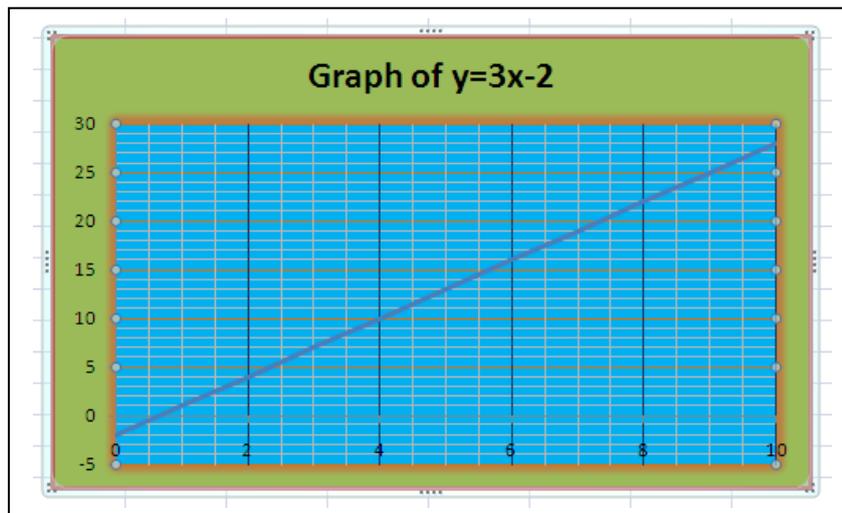
Before starting to improve it further, **Save your spreadsheet**, giving it an appropriate name. *Remember to save the spreadsheet periodically whilst you work on it.*

You can label your axes using *Chart tools, Layout, Axis titles*, and choosing to display a title in an appropriate way. Label your axes x and y and move the labels to the ends of the axes.

Another way to alter the appearance of your graph is to select the chart element you want to change directly by clicking on the arrow here. This gives a list of elements which can be changed by selecting the element and then clicking on *format selection*. Don't forget that you can remove any change you do not like by clicking on the *Undo* button.




You can experiment by making other changes to the graph, using colours and other affects.



You will notice that a graph with pretty colours like this may look cute on the screen, but when it is printed in black and white in your coursework it will just look grey and fuzzy, so stick to black for major gridlines, grey for minor gridlines and clear backgrounds.

Sometimes we want to draw two graphs on the same axes. This is quite simple.

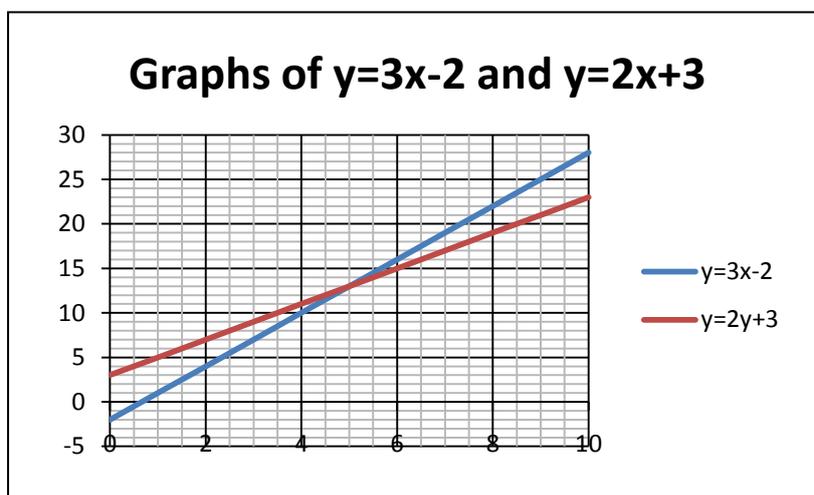
If necessary, move your graph so that you can see column C.

In cell C2 type the formula $=2*A2+3$ and then copy the formula down to C12.

Now select *Chart tools, Design, Select Data* and then click on ADD. In the dialog box which comes on the screen type $y=2x+3$ in the series name box. Now click in the series x values and drag from cell A2 to A12. Delete the stuff in the series y values box and then drag from C2 to C12.

You should now have two lines on your graph, one blue and one red. You now need a legend (*chart tools, layout*) to say which is which and you can make the labels the same by clicking on *Chart tools, design, select data*, click on the y and then edit and change the series name to $y=3x-2$.

The final step would be to change the title of the graph to something like “Straight line graphs” or “Graphs of $y=3x-2$ and $y=2x+3$ ” or some other interesting title.



Use Excel to draw graphs of the following functions.

In the **first three** use a scatter graph ‘with data points connected by lines without markers’ – the **last Scatter Graph option**.

In the **others** choose a scatter graph ‘with data points connected by smoothed lines without markers’ – the **3rd Scatter Graph option**.

Function	x values	Value in A2	Excel formulae for:		Fill down to
			A3	B2	
$y = 5x$	0 to 10	0	=A2+1	=5*A2	A12 and B12
$y = \frac{1}{2}x + 3$	0 to 10	0	=A2+1	=A2/2+3	A12 and B12
$y = 5 - 2x$	0 to 5	0	=A2+1	=5-2*A2	A7 and B7
$y = x^2$	-4 to 4	-4	=A2+0.5	=A2^2	A18 and B18
$y = 3x^2$	-4 to 4	-4	=A2+0.5	=3*A2^2	A18 and B18
$y = x^2 + 3$	-4 to 4	-4	=A2+0.5	=A2^2+3	A18 and B18
$y = \frac{1}{x}$	0.2 to 5	0.2	=A2+0.2	=1/A2	A26 and B26
$y = \frac{2}{x}$	0.2 to 10	0.2	=A2+0.2	=2/A2	A51 and B51

Experiment with other functions if you have time.



Teacher Notes

Unit Intermediate Level, *Using algebra, functions and graphs*
Intermediate Level, *Making connections in mathematics*
Advanced Level, *Working with algebraic and graphical techniques*

Skills used in this activity:

- drawing graphs of functions in Excel

Preparation

Students need to have some basic knowledge of computer terminology and the use of computers (eg how to use the mouse and menus in Excel).

Notes on Activity

This activity can be used at the start of the course to introduce graph plotting in Excel. The functions listed on page 9 can be altered or extended as you wish.

Suggested follow-up activities are listed below:

Using algebra, functions and graphs – Spreadsheet Graphs (in Skills Activities)

Making connections in mathematics – Linear Graphs (in Skills Activities)

Working with algebraic and graphical techniques – Interactive Graphs (in Starters)

