

The goal of this assignment is to graph two different functions and to locate where the functions intersect. You'll start by doing this on your graphing calculator and finish by making a graph in Excel that you can submit for grading.

The functions for this assignment describe the costs and revenue from a dairy farm as a function of the number of dairy cows.

Dairies in the Tillamook County Creamery Association (TCCA) supply milk to the Tillamook Cheese Factory in Tillamook, Oregon. Each dairy has between 25 and 1000 dairy cows.



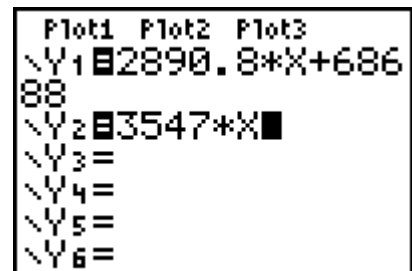
According to the TCCA, each cows costs approximately $\$1500 + 10 \times F$ annually where F is the number of letters in your first name. Through breeding and milk production, each cow brings in $\$3500 + 50 \times L$ annually where L is the number of letters in your last name. Equipment depreciation, real estate taxes and interest on loans cost the dairy $\$10,000 \times M$ annually, where M is the month of the year you were born in (January = 1, February = 2, March = 3, ect.)

For this assignment you'll need to find the total cost function and total revenue function for the dairy corresponding to the information above. Once you have found the function, you'll make a graph of the functions to show where the break-even point is.

For the demonstration below, we'll assume $C(x) = 2890.8x + 68688$ and $R(x) = 3547x$.

Graph the Formulas on a TI-84

1. Press the $\boxed{\text{ON}}$ key to turn your calculator on.
2. To enter the formula into the calculator, press the $\boxed{\text{Y=}}$ key.
3. In the first line after \Y1= , type the formula. For the formula pictured to the right, type $\boxed{2}\boxed{8}\boxed{9}\boxed{0}\boxed{.}\boxed{8}\boxed{\times}\boxed{\text{X,T,}\theta,\eta}\boxed{+}\boxed{6}\boxed{8}\boxed{6}\boxed{8}\boxed{8}\boxed{\text{ENTER}}$. You'll need to change the numbers for your formula.
4. In the second line after \Y2= , type $\boxed{3}\boxed{5}\boxed{4}\boxed{7}\boxed{\times}\boxed{\text{X,T,}\theta,\eta}$

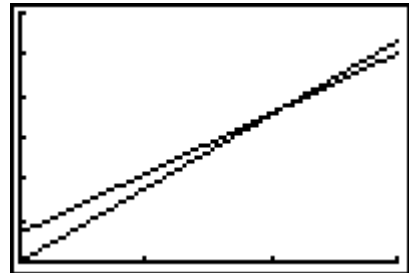


5. Now we'll adjust the viewing window on the calculator.
Press **WINDOW** to see the current window.
6. You'll see a screen like the one to the right. This window defines the left, right, upper and lower boundaries of the graphing window. Since X_{min} is -10, X_{max} is 10 and X_{sc1} is 1, the horizontal extent of the window will be from -10 to 10 with tick marks on the x-axis every 1 unit. Since Y_{min} is -10, Y_{max} is 10 and Y_{sc1} is 1, the vertical extent of the window will be from -10 to 10 with tick marks on the y-axis every 1 unit.
7. Adjust the window to extend horizontally from 0 to 150 in increments of 50. Extend the vertical extent of your window so that you can see all of your graph. Try the values shown to the right to start with. If you do not see any points of intersection, you can always press **WINDOW** and adjust the values here.

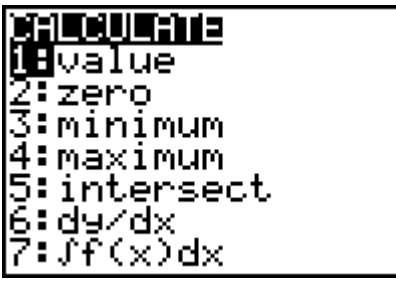
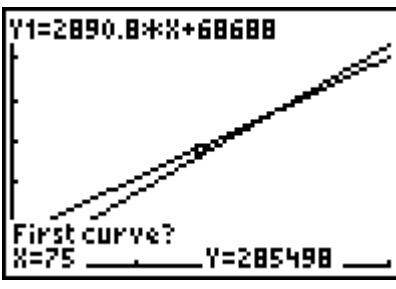
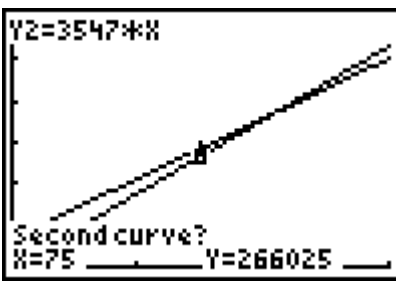
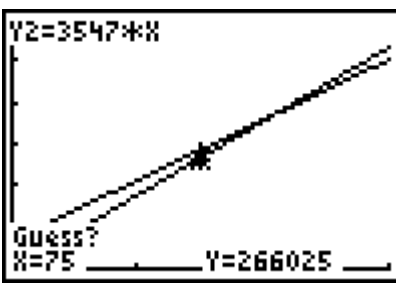
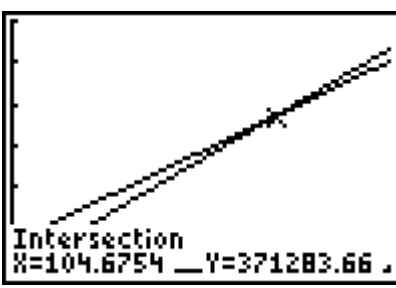
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WINDOW
Xmin=0
Xmax=150
Xsc1=50
Ymin=0
Ymax=600000
Ysc1=100000
Xres=1
    
```

8. Press **GRAPH** to see the graph of the formula. Make sure that you have adjusted Y_{max} and Y_{min} so that your graph enters on the left and right sides of the graph like the one shown to the right. If your graph enters on the top or bottom of the window, go back to step 5 and adjust the vertical extent of the window.
9. Once you have an appropriate graph, press **WINDOW** and make a note of the settings. You'll want to use the same settings for the graph you make in Excel.

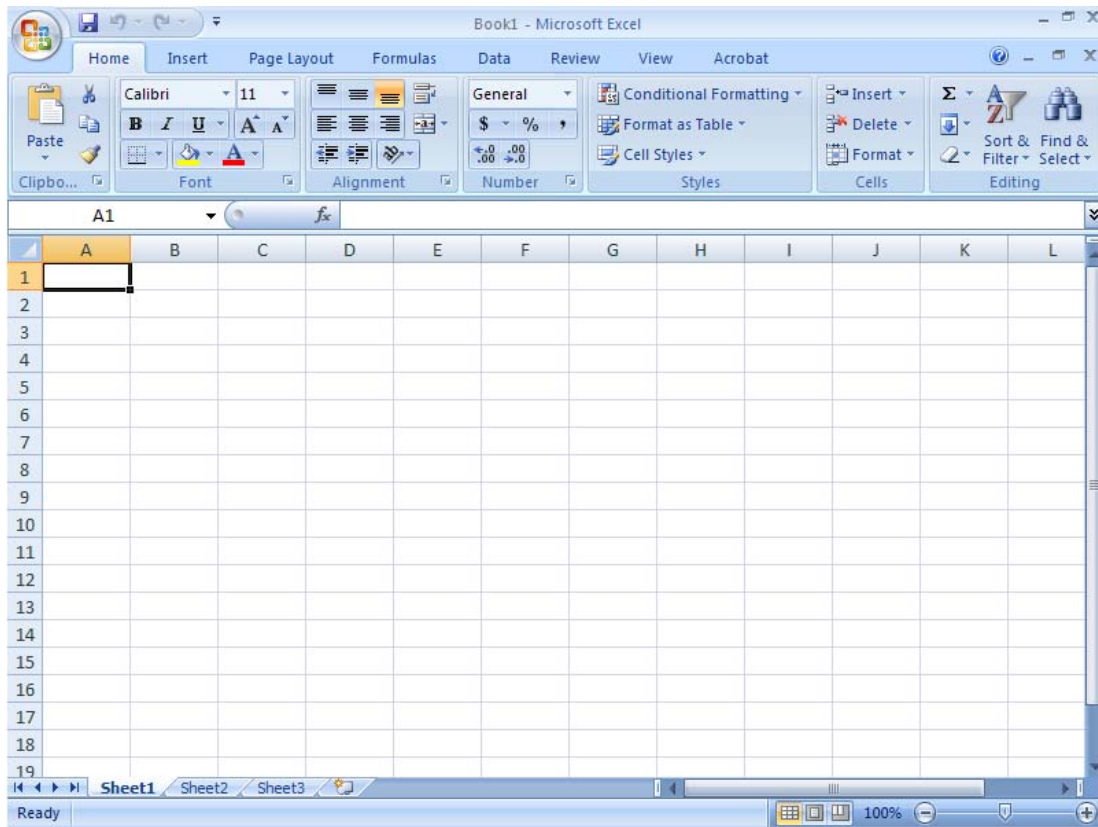


Find the Point of Intersection on a TI-84

<p>1. Starting from the window shown above, press 2nd TRACE to enter the Calculate menu.</p>	
<p>2. Use the ↓ button to highlight 5: intersect and press ENTER or simply press 5.</p>	
<p>3. A blinking x is located on one of your curves indicating that this is one of the curves to intersect. If this is the correct curve, press ENTER. If it is not, use the ↑ ↓ buttons to move to the proper curve and press ENTER.</p>	
<p>4. Repeat step 3 to indicate the second curve to intersect.</p>	
<p>5. Now use the ← → buttons to move the x to a point near the point of intersection.</p> <p>6. Press ENTER to locate the point of intersection. According to the calculator, the point of intersection is at approximately (104.6754, 371,283.66).</p>	

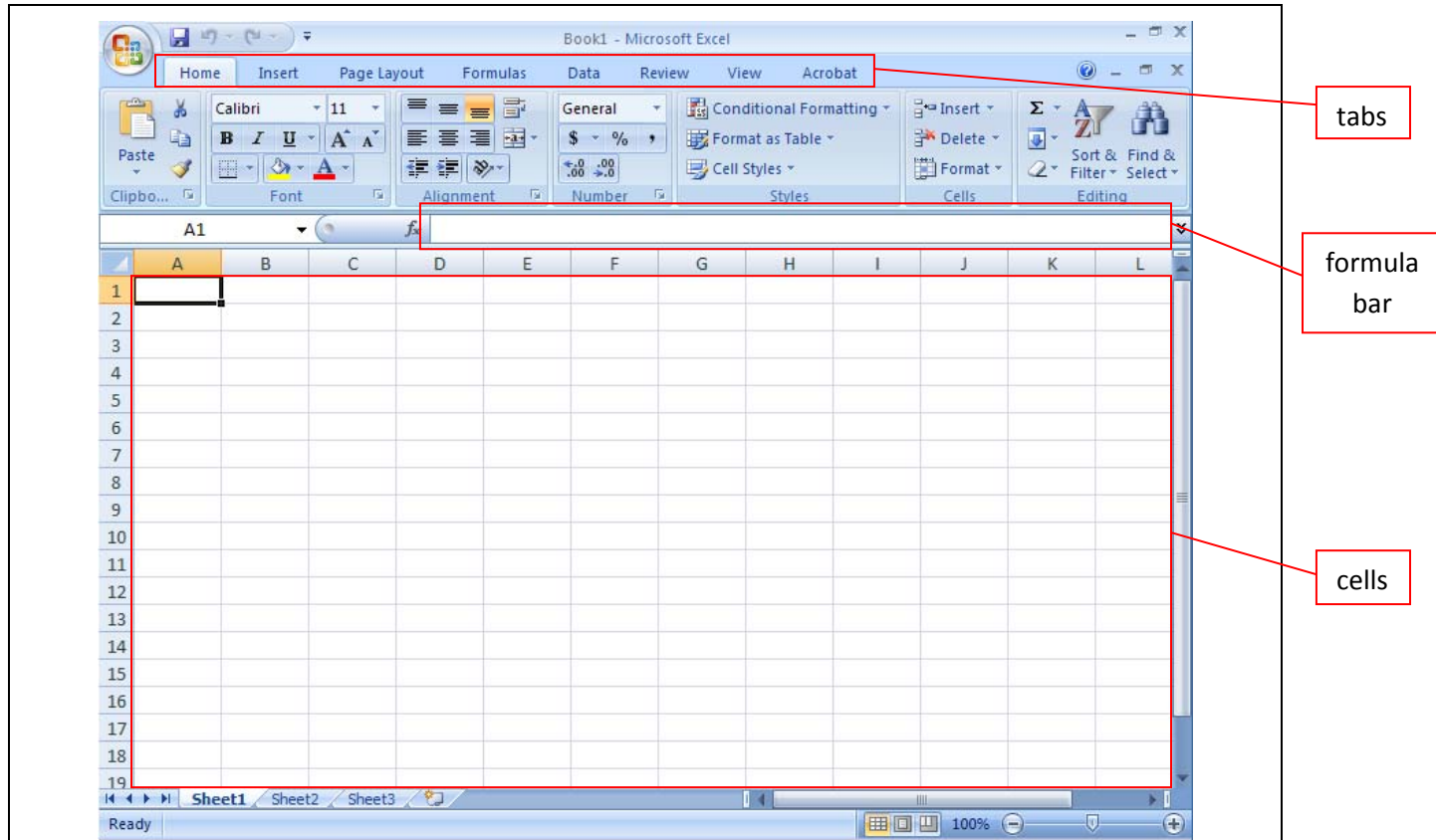
Graph the Formula in Excel 2007

1. Start Excel 2007.
2. You should see a screen like the one below once Excel 2007 has started.

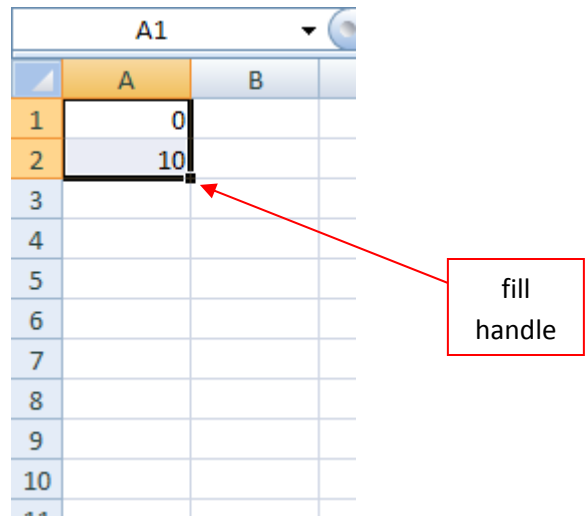


3. Excel has many capabilities that allow it to do calculations and make different types of graphs. Along the top of the window are the tabs. As shown, the Home tab is selected. This tab contains many formatting options as well as the copy and paste buttons. Other tabs can be selected such as Insert, Page Layout, ect. Other tabs will appear as needed as you work in Excel.
4. The main part of Excel is the cells. The cells form a large table. For instance, the black box is currently in cell A1 meaning that it is in the column labeled A and the row labeled 1. You can click your mouse in other cells and see the location of the cell change in the label just above the cells.
5. Above the cells is the formula bar. This is where you will enter formulas you want Excel to calculate.

Technology Assignment – Break-Even on the TI 84 and in Excel

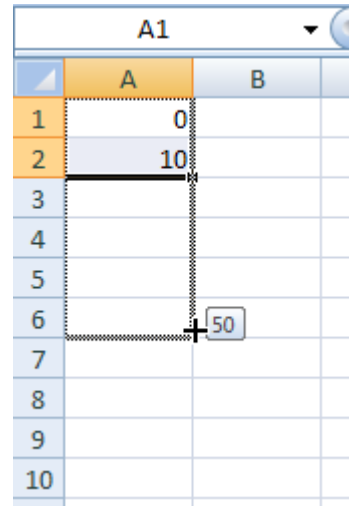


6. In cell A1 type 0 and in cell A2 type 10.
7. Click your mouse in cell A1. While holding the left mouse button down, drag your mouse to cell A2. You should see a black box around cells A1 and A2 like the one to the right.
8. In the lower right hand corner of this black box is the fill handle. This handle allows you to fill cells with numbers without having to enter the numbers individually.

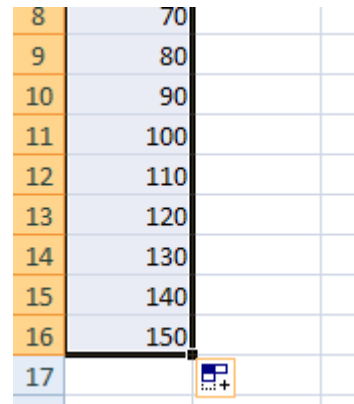


9. Place your mouse over the fill handle. The cursor should change to a black cross.

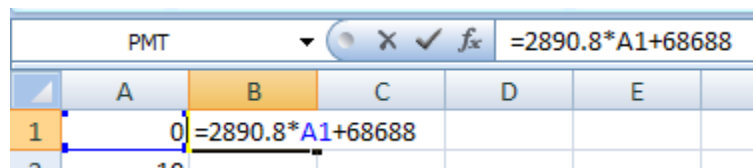
10. Hold the left mouse button down and drag the cursor down. The box will expand as you drag the mouse like shown to the right. As you drag, numbers will appear like the 50 shown indicating what numbers will be placed into the corresponding cell. Since the pattern established by the first two numbers indicates that the numbers should increase by 10 in each cell, the cells will contain 0, 10, 20, 30, ...



11. Drag the mouse to cell A16. This will fill the cells A1 through A16 with the numbers 0, 10, 20, 30, ..., 150. These numbers will be the x-values in the graph we will create. You may need to drag the fill handle lower to create a bigger horizontal window on your graph.



12. Now we'll type in the cost formula. In cell B1, type = 2890.8*A1+68688. You can click on cell A1 instead of typing A1 if you want. It is very important to start with an = so that Excel knows you want it to do a calculation. It is also important to type the * for multiplication. Make sure you modify the values to reflect the formula you are graphing.



13. Press Enter on the keyboard. This will cause Excel to calculate the cost at $x = 0$. You may get a different number depending on your formula.

	A	B	C
1	0	68688	
2	10		
3	20		

14. Click your mouse in cell B1 again.
15. Grab the fill handle and drag it to cell B16.

	A	B
1	0	68688
2	10	
3	20	
4	30	
5	40	
6	50	
7	60	
8	70	
9	80	
10	90	
11	100	
12	110	
13	120	
14	130	
15	140	
16	150	
17		

16. Release the mouse button. The cells will be filled with y-values from your formula where the x-values come from the corresponding cells in the A column. This is the table we will use to create the graph of the formula.

B1		
	A	B
1	0	68688
2	10	97596
3	20	126504
4	30	155412
5	40	184320
6	50	213228
7	60	242136
8	70	271044
9	80	299952
10	90	328860
11	100	357768
12	110	386676
13	120	415584
14	130	444492
15	140	473400
16	150	502308
17		

17. Now we'll type in the revenue formula. In cell C1, type = 3547*A1.

PMT					
	A	B	C	D	E
1	0	68688	=3547*A1		
2	10	97596			
3	20	126504			

18. Press ENTER on your keyboard.

C2			
	A	B	C
1	0	68688	0
2	10	97596	
3	20	126504	

19. Click on cell C1,

20. Drag the fill handle down to cell C16 and release the mouse button.

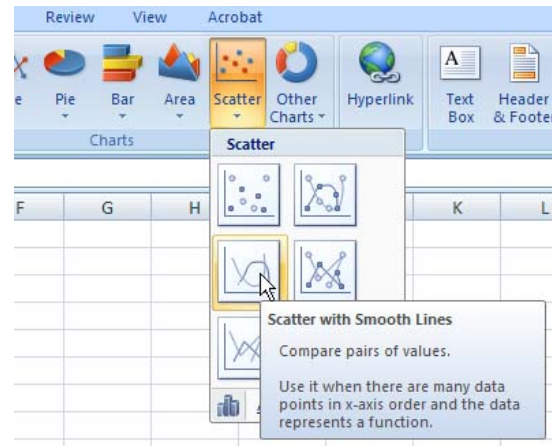
	A	B	C
1	0	68688	0
2	10	97596	35470
3	20	126504	70940
4	30	155412	106410
5	40	184320	141880
6	50	213228	177350
7	60	242136	212820
8	70	271044	248290
9	80	299952	283760
10	90	328860	319230
11	100	357768	354700
12	110	386676	390170
13	120	415584	425640
14	130	444492	461110
15	140	473400	496580
16	150	502308	532050
17			

21. Click in cell A1 and hold down the left mouse button.

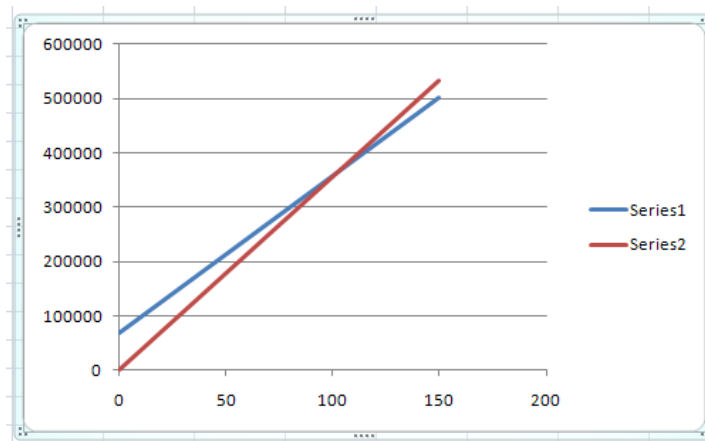
22. Drag the cursor to cell C16 to select the cells in your table.

	A	B	C
1	0	68688	0
2	10	97596	35470
3	20	126504	70940
4	30	155412	106410
5	40	184320	141880
6	50	213228	177350
7	60	242136	212820
8	70	271044	248290
9	80	299952	283760
10	90	328860	319230
11	100	357768	354700
12	110	386676	390170
13	120	415584	425640
14	130	444492	461110
15	140	473400	496580
16	150	502308	532050
17			
18			

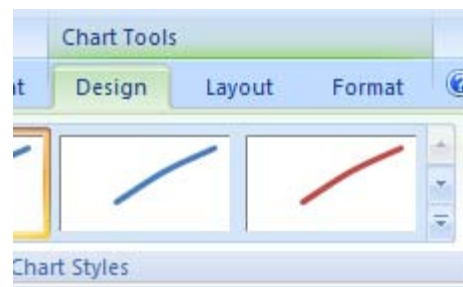
23. Click your mouse on the Insert tab.
24. Under the Charts panel, select Scatter.
25. From the different types of graphs, select Scatter with Smooth Lines as shown. Other options allow you to create other types of graphs.



26. Your graph will appear. This is a very basic graph. The horizontal window is based on the numbers you entered in column A. Excel creates a vertical window based on the values in column B. We'll now customize the graph to make it look nice.

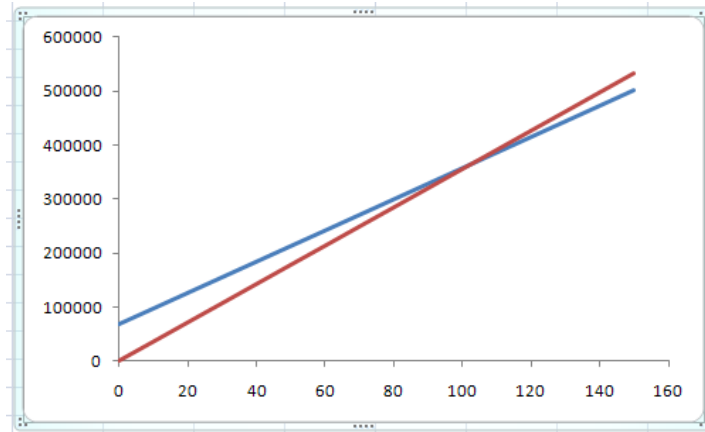


27. Notice that when you click outside of the graph, the tabs along the top of the window change. To customize the graph, we need to make sure that the graph is selected (click the mouse on it). You'll see a set of tabs like those shown to the right. These tabs allow you modify the look and features on your graph.

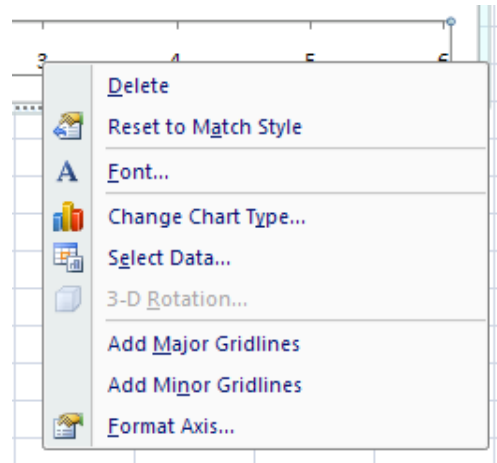


28. To begin, let's eliminate the legend "Series 1" and "Series 2" on this graph. Click on the legend so that it is highlighted and press the Delete key on your keyboard. The legend should disappear.

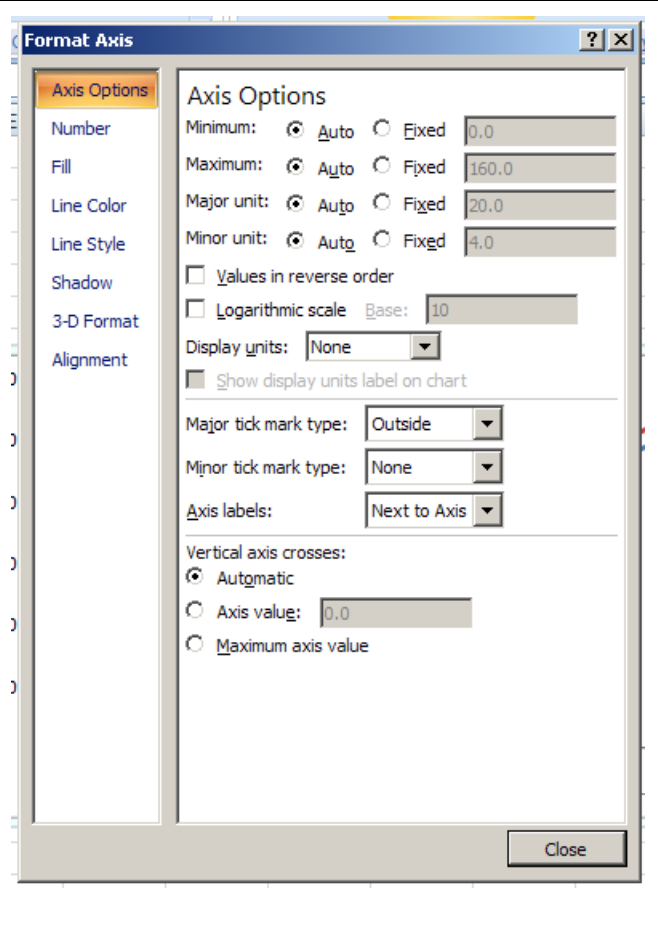
29. Click on one of the horizontal gridlines so that they are highlighted. Press Delete on the keyboard to get rid of them. Your cleaned up graph should look like the one below. This graph is very similar to the one you obtained on your calculator, except the axes are labeled.



30. The last modification we'll make to this graph is to change the viewing window. **Right** click on one of the numbers in the horizontal axis scale. A menu like the one to the right should appear. If it does not, try right clicking again.



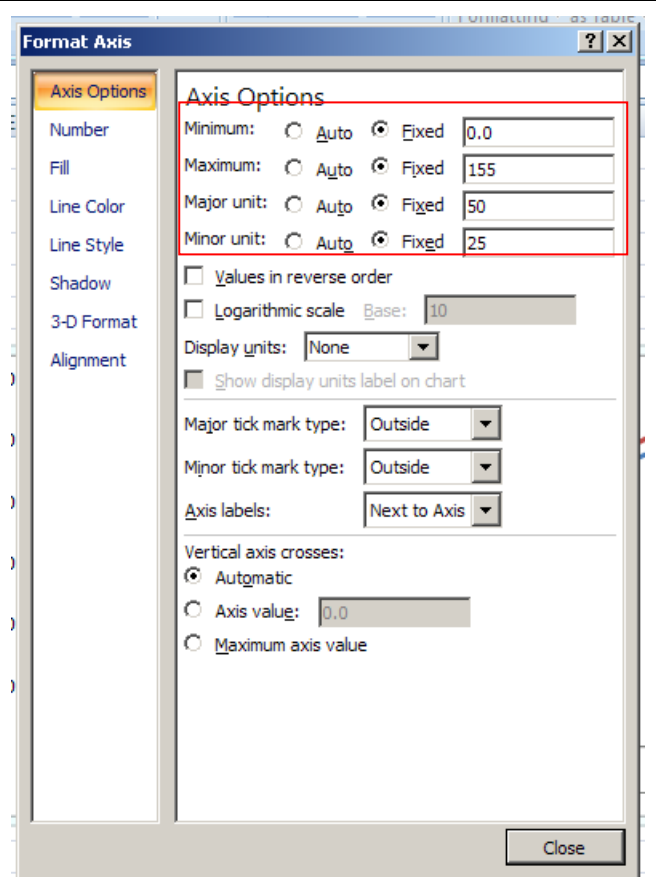
31. Select the Format Axis... option. The box on the right will appear. In this technology assignment we are interested in the Axis Options. Using Axis Options, you can change the change the left and right limits of your window as well as how often a tick mark is made on the horizontal axis.



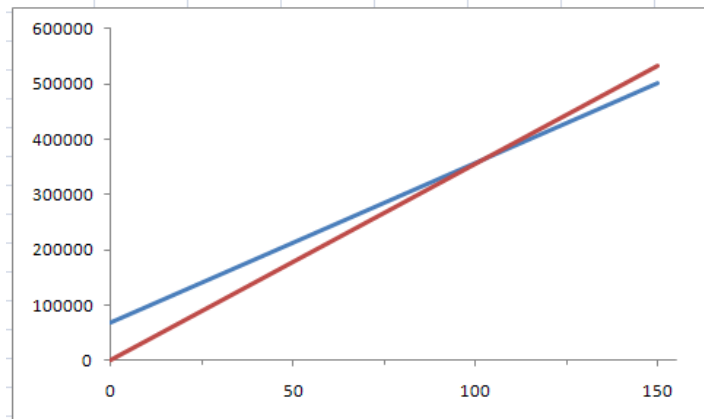
32. Under Axis Option, click on Fixed next to Minimum. You can select any value to put into the box. Keeping it at 0.0 means that Xmin for the graph will stay fixed at 0.0. Click on Fixed next to Maximum. You can select any value to put into the box. Change it at 155 means that Xmax for the graph will stay change to 155. Making these changes will insure that the graph is in a horizontal window from 0 to 155.

33. Now change the Major and Minor units as shown. The Major units are where the scale numbers appear. Setting the Major unit to 50 means that a number will appear on the horizontal scale at every 50 units. Minor units are simply tick marks on the axis without numbers. Setting the Minor unit to 25 means that a tick mark will appear every 25 units. Make sure you select Outside for the Minor tick mark type to insure they appear in your graph.

34. Select Close to see the changes in the graph.



35. Your graph will be changed as seen below.

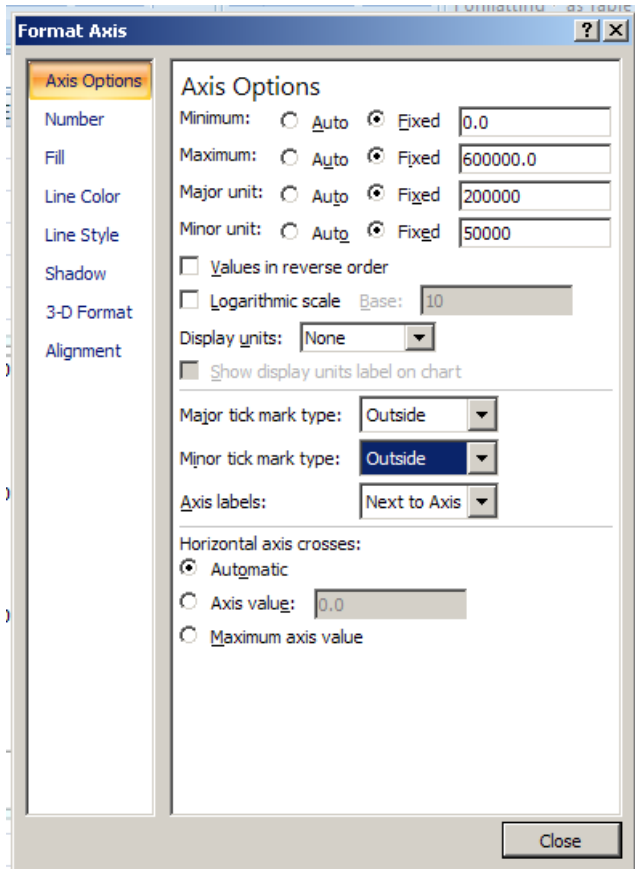


Notice the scaling at every 50 units and the tick mark at every 25 units on the horizontal axis.

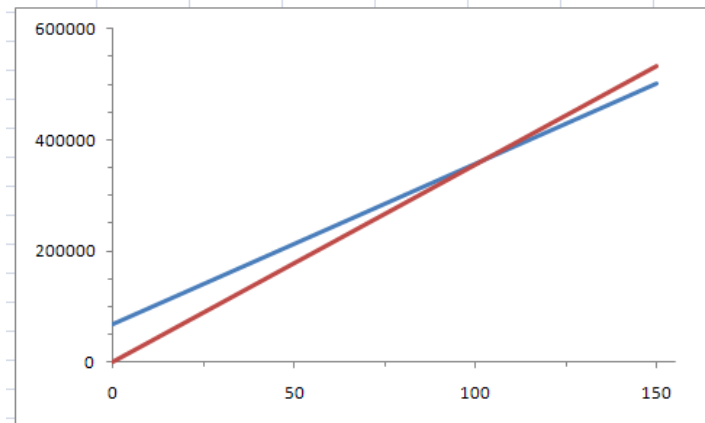
36. Right mouse click on one of the numbers on along the vertical axis.

37. Select Format Axis...

38. Adjust the numbers to reflect those on the right.

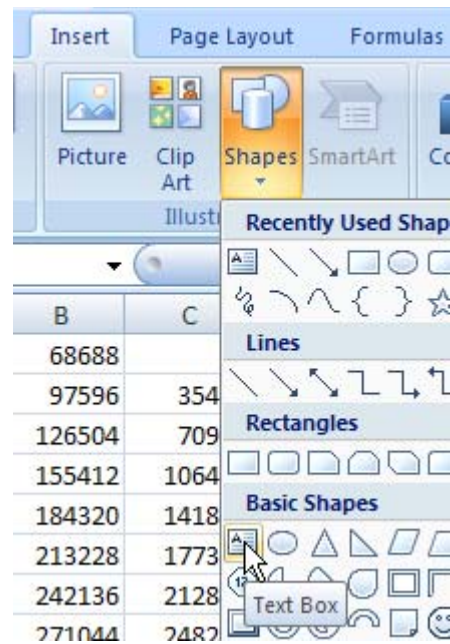


39. Your graph should now look similar to the one below.

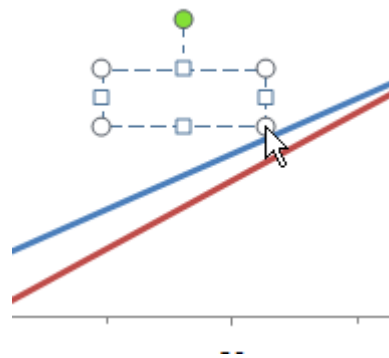


The vertical axis has labels every 200,000 units and tick marks every 50,000 units.

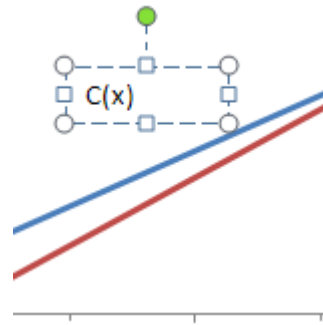
40. To finish off the graph, let's label each line.
Click on the graph's edge to select it.
41. Click on the Insert tab.
42. Under the Illustrations tab, select the Shapes button.
43. Now select Text Box.



44. Click and hold the mouse on the graph. Drag the mouse to create a box.

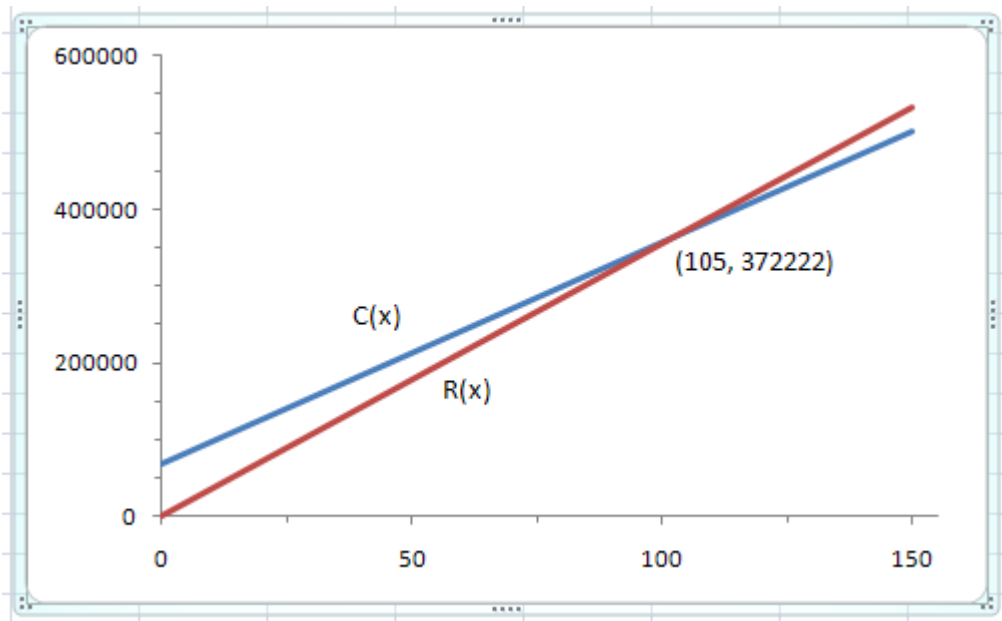


45. Type $C(x)$ in the box to indicate the cost function. You may also need to click on the edge of the text box and drag it to a position closer to the cost line.



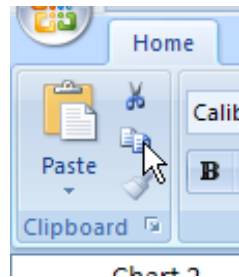
46. Repeat steps 40 to 45 to label the revenue line with $R(x)$.

47. Repeat steps 40 to 45 to label the point of intersection.



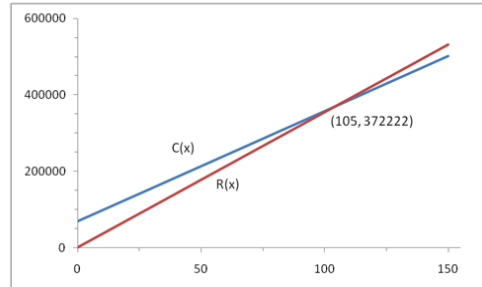
48. To finish this tech assignment, you need to copy your graph from Excel to word processing document in Word (or a similar program). Click on your graph to select it.

49. On the Home tab, left click on the Copy button to copy the graph to the clipboard.



50. Open Word (or another word processing program).
51. At the top of the document, type your name, class, and the date followed by a carriage return (Enter).
52. In Word, left click on the Home tab. Select Paste to paste the graph into your Word document. Your document should look similar to the one shown to the right.

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August 18, 2009



53. Finally, you need to save this document to a convenient location. In the upper left hand corner of Word, left click on the disk icon. Give the document an appropriate name and location and select Save.
54. You can also select the Office button to the left of the disk icon. This is useful to save the document with a new file name. In this case you would select Save As... and then give an appropriate name. If you are working on a document over several days, it is advisable to save the document with a slightly different name on each day based on the date. This allows you to recover earlier version of a document in case you need to refer to earlier work.
55. In Excel, save your Excel worksheet by following the steps 42 through 44.

