Breakeven Analysis & Market Equilibrium

You can find the equilibrium point of a supply-demand problem, of the breakeven point of a profit-revenue-cost problem using the Goal Seek option in Excel.

EXAMPLE: Find the breakeven point if \( R(x) = 50x \) and \( C(x) = 10x + 200000 \).

We can graph the equation using the procedure discussed in a previous lab. To graph two or more equations, be sure that the column of \( x \)-values is first, followed by the column of \( y \)-values for the first function, then the column of \( y \)-values for the second function, etc. Note that both functions are evaluated at the same \( x \)-values.

Find the revenue and cost for \( x = 0, 1000, 2000, 3000, \) and \( 4000 \).

<table>
<thead>
<tr>
<th>x</th>
<th>( R(x) = 50x )</th>
<th>( C(x) = 10x + 200000 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>200000</td>
</tr>
<tr>
<td>1000</td>
<td>50000</td>
<td>210000</td>
</tr>
<tr>
<td>2000</td>
<td>100000</td>
<td>220000</td>
</tr>
<tr>
<td>3000</td>
<td>150000</td>
<td>230000</td>
</tr>
<tr>
<td>4000</td>
<td>200000</td>
<td>240000</td>
</tr>
</tbody>
</table>

To graph both lines at the same time, click and drag to highlight the three columns of values. Go to the Chart Wizard (the icon is on the tool bar and looks like a bar chart), select the XY(Scatter) option in the left column and select the Scatter with data points connected by lines icon (bottom row, first column on the right side of options). Select Next once, then click on the Series tab. You can label each line in the legend of the graph. Highlight Series1 under the Series column and type Revenue for the Name. Then highlight Series2 under the Series column and type Cost for the Name. Select Next, and title the Chart and label the axes. Select Next and Finish to create the graph. You can move the graph by clicking and holding anywhere in the white area of the graph, and then just move your mouse.
To find the break-even point, we need to find where Revenue = Cost, or where Profit = 0. Return to your table of values and create a fourth column, labeled $P(x) = R(x) - C(x)$.

To find the break-even point, copy and paste the formulas for Revenue, Cost, and Profit into the next available cell in respective columns. Do not enter a value for $x$. 
Click and highlight the profit cell (where the -200000 is currently). Go to Tools on the menu bar and select Goal Seek.

The location of the -200000 should already be in Set Cell. Enter 0 (zero) in the To value, and enter the location of empty x-value in the By changing cell.
Once these values are entered, click OK to find the breakeven point.

So the company should produce and sell 5000 units in order to break even.

1. Suppose a calculator manufacturer has the total cost function \( C(x) = 67.75x + 12114 \) and the total revenue function \( R(x) = 110.5x \).
   a. Create a table of values (at least 5 values) and graph both functions on the same set of axes.
   b. Find the breakeven point (round your answer to the nearest unit).

2. Suppose that a certain product has the following supply and demand functions:
   \[
   \begin{align*}
   \text{Demand: } & \quad p = -3.2q + 15000 \\
   \text{Supply: } & \quad p = 2.4q + 100
   \end{align*}
   \]
   a. Create a table of values (at least 5 values) and graph both functions on the same set of axes.
   b. Find the equilibrium point.