

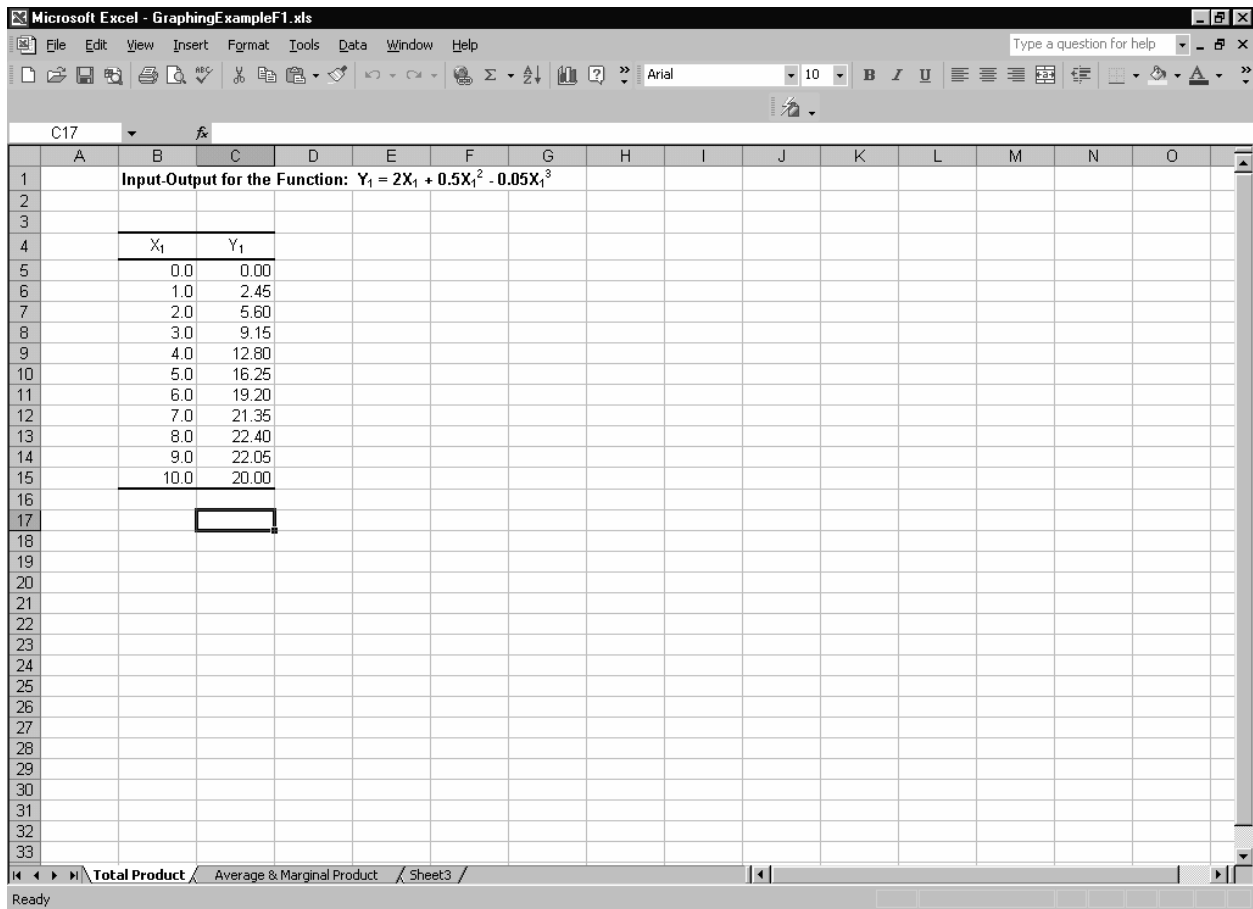
# Basic Steps for Graphing Economic Production Data Using Excel

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## I. Introduction

Assume you want to make a chart showing the relationship between output ( $Y_1$ ) produced for different levels of variable input ( $X_1$ ) used. The data is in columns in an Excel sheet as shown below:

Figure 1.



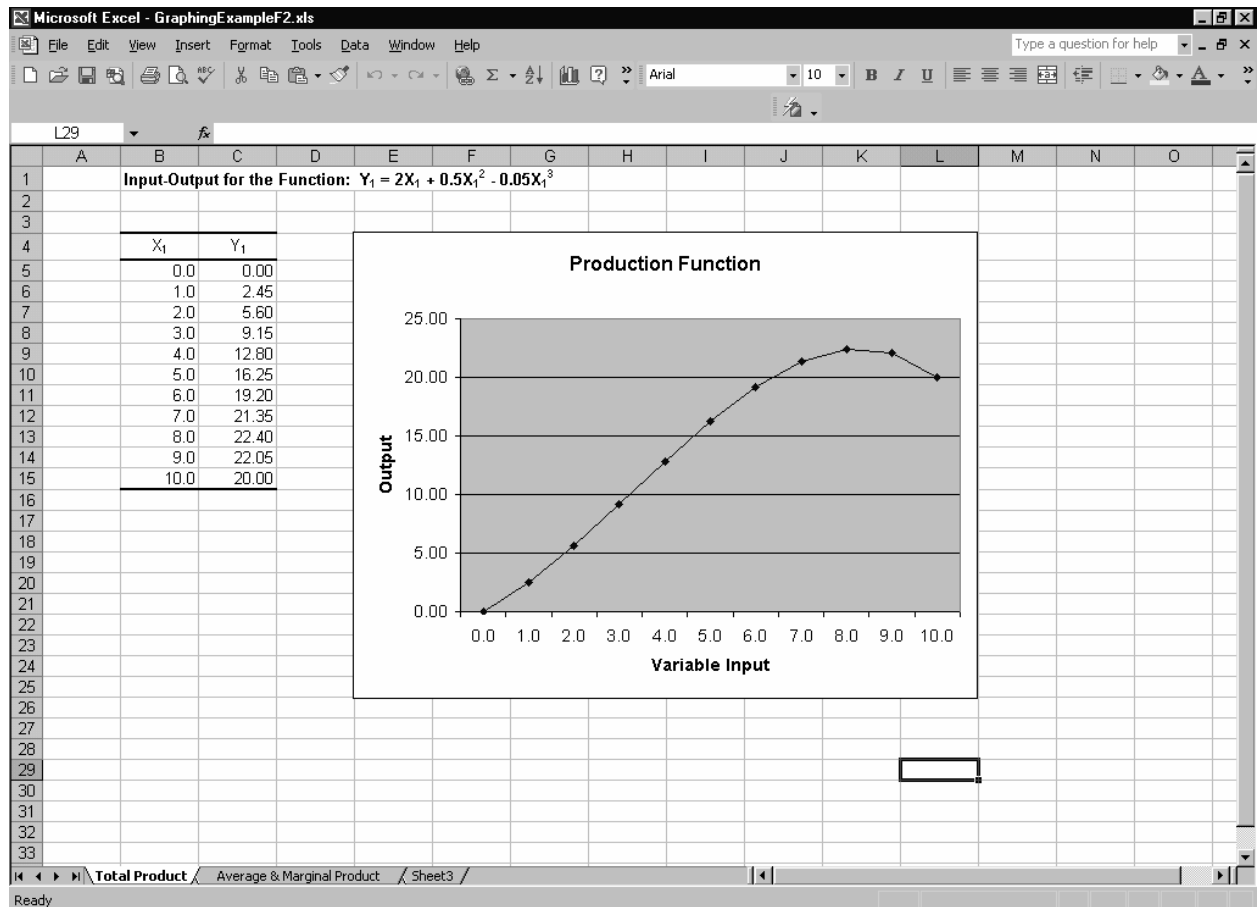
This amounts to graphing  $Y_1$  against  $X_1$ . The horizontal axis will show the amounts of  $X_1$  used, while the vertical axis will indicate the values for  $Y_1$ . A second chart may be plotted showing average product and marginal product along the vertical axis with the amounts of the variable input on the horizontal axis. (The average and marginal product calculations will be shown in a later figure).

## II. Graphing the Production Function Using the Line Chart and Printing the Chart

1. Highlight the range of the series to graph on the chart. For the first chart, this would be C5:C15 in the Figure 1.
2. In the top of your Excel screen, select the *Chart Wizard* (or select *Chart* under *Insert* in Excel menu bar).
3. Choose a *Line* under the *Standard Types* tab.
4. Click *Next* and the Chart Wizard takes us to *Step 2 of 4*. The chart is shown in a crude form. The values in the vertical axis are correct but not the values of the horizontal axis. Now it's time to make adjustments and refine the appearance of the graph.
  - a. Click on the *Data Range* tab and make sure that the data range the program has picked is correct. (In this case the data is in column C, rows 5 through 15). In the data range include only numbers and not any labels. Labels will be added manually later. Click, also, that the data is in Columns.
  - b. Click on the *Series* tab. Go to the space next to *Category (X) axis labels* and click on the little red arrow to the right of that space. This will reduce the big panel to a small one and allow you to see the data.
  - c. Using the mouse, highlight the values of the column which represent the variable input (These values are in column B, rows 5 through 15).
  - d. Click on the right little arrow of the small panel and the large panel reappears. Now the correct values should appear on the horizontal axis.
5. Click on *Next* to go to *Step 3 of 4*. In this step further refinements are made to the chart.
  - a. Click on *Titles* tab to add a title to the Chart and to the two axes. Title the chart Production Function, label the horizontal axis as Variable Input and label vertical axis as Output.
  - b. Click on *Axis* tab and put check marks next to *Category (X) axis, automatic*, and *Value (Y) axis*.
  - c. Click on *Gridlines* tab and put a checkmark on *Major Gridlines of Value (Y) axis*.
  - d. Next click on the *Legend* tab and choose not to have the legend appear.
6. Click on *Next* to go to *Step 4 of 4*. Click on the button next to *As Object In* for the chart to appear along with the spreadsheet numbers. (For the chart to appear on a separate sheet in the workbook, select *As a New Sheet* and type a unique name describing the chart in the space provided.)

7. Click on *Finish* and the finished chart appears in the sheet along with the data. Resize the chart so that it spans from E4 to L25. The chart should appear along side the data as shown in Figure 2.

Figure 2.



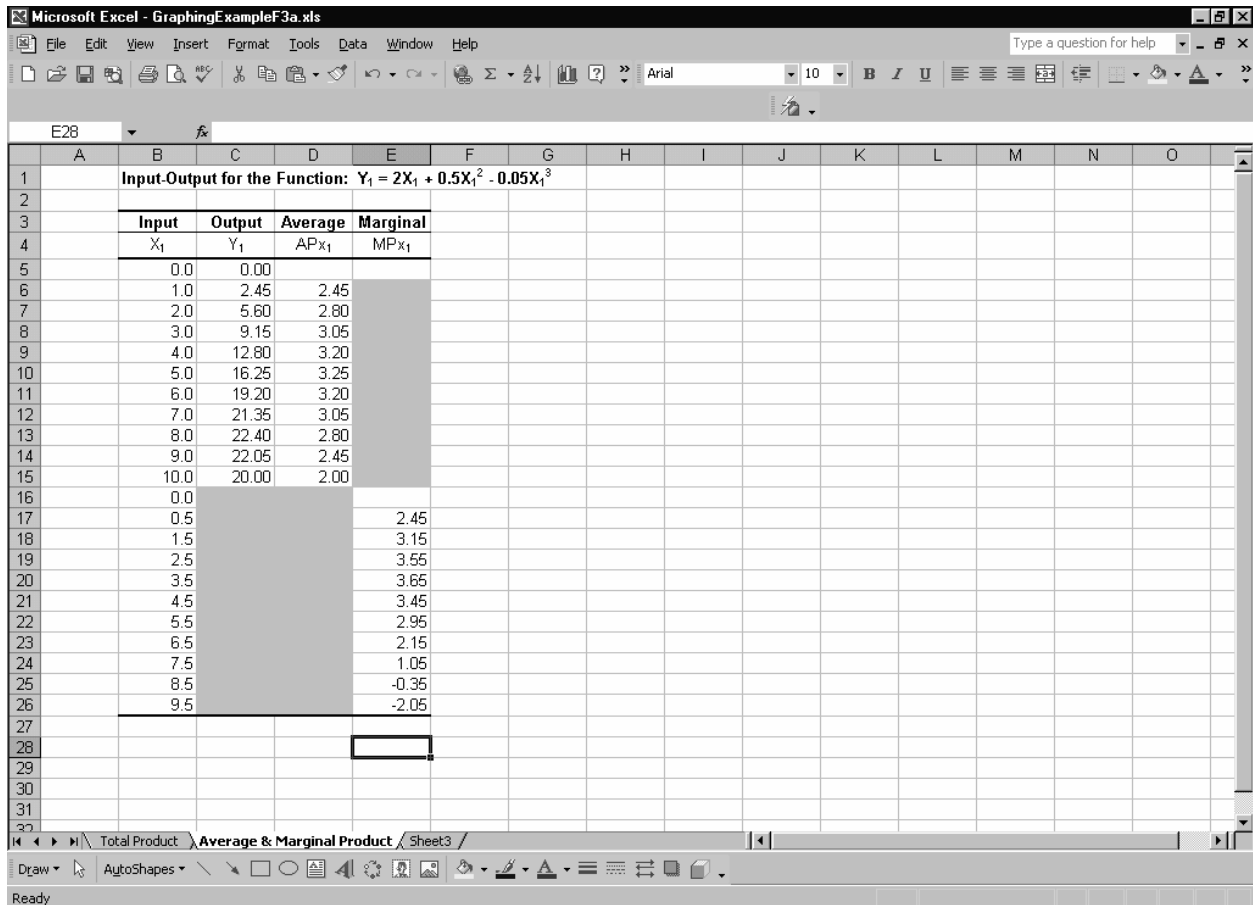
8. For additional improvements on the appearance of the chart, place the mouse on a particular area of the chart such as an axis or title and click the right button of the mouse. A menu will appear allowing changes to be made to that part of the chart.
9. The chart may be printed as part of the worksheet, as a separate figure or brought into a word processor to become a permanent part of a document.
  - a. To print the worksheet data along with the chart, select *Print Preview* under *File* and adjust the settings as necessary before printing the worksheet.
  - b. To print the chart only, click on the chart so that several black square dots appear on the outside of the graph. Go to *Print Preview* and adjust settings prior to printing.

- c. To incorporate the chart into a document. Click on the chart until several black square dots appear on the outside of the graph. Click on the *Edit* (in the top menu of Excel). And select *Copy*. You will see a broken line surrounding the whole chart. The chart is copied to the computer's clipboard. Click on the upper right corner of the screen to minimize Excel. Open the word processor you use and bring up the document into which you want to insert the chart. Place the cursor in the position you want to see the chart appear. Press *Enter* a couple of times to make a little room. Click on *Edit* (on the top menu of the word processor) and from the menu that appears click on *Paste*. Wait for a few seconds and the chart will appear. Now it has become part of the document. If the chart size is not proper for the document, adjust it by clicking and dragging the black square dots.

### III. Graphing Average Product and Marginal Product Using an XY Scatter Chart

Figure 3 shows the original input and output relationship graphed earlier, but also contains calculations for average product ( $AP_{X_1}$ ) and marginal product ( $MP_{X_1}$ ). Note input midpoints are shown so that marginal product may be plotted on the same graph as average product.

Figure 3.



1. Do not highlight any data series.
2. In the top of your Excel screen, select the *Chart Wizard* (or select *Chart* under *Insert* in Excel menu bar).
3. Choose a *XY (Scatter)* under the *Standard Types* tab and select the *Chart sub-type* described as *Scatter with data points connected by smoothed Lines*.
4. Click *Next* and the Chart Wizard takes us to *Step 2 of 4*. No chart is shown because the series have not been specified.
  - a. Click on the *Series* tab and click the *Add* button.
  - b. In the *Name* box, type AP. Go to the space next to the *X Values* and click on the little red arrow to the right of that space. Using the mouse, highlight the values of the column which represent the variable input. (Values are in column B, rows 5 through 15). Click the red little arrow of the small panel and the large panel reappears. Go to the space next to the *Y Values*, and first backspace to remove any info in the *Y Values* box then click on the little red arrow to the right of that space. Using the mouse, highlight the values of the column which represent average product. (Values are in column D, rows 5 through 15). Click the red little arrow of the small panel and the large panel reappears
  - c. Click the *Add* button. In the *Name* box, type MP. Go to the space next to the *X Values* and click on the little red arrow to the right of that space. Using the mouse, highlight the values of the column which represent the variable input midpoints. (Values are in column B, rows 16 through 26). Click the red little arrow of the small panel and the large panel reappears. Go to the space next to the *Y Values* and first backspace to remove any info in the *Y Values* box then click on the little red arrow to the right of that space. Using the mouse, highlight the values of the column which represent marginal product. (Values are in column E, rows 16 through 26). Click the red little arrow of the small panel and the large panel reappears.
5. Click on *Next* to go to *Step 3 of 4*. In this step further refinements are made to the chart.
  - a. Click on *Titles* tab to add a title to the Chart and to the two axes. Title the chart Average & Marginal Product and label the horizontal axis as Variable Input.
  - b. Click on *Axis* tab and put check marks next to *Value (X) axis* and *Value (Y) axis*.
  - c. Click on *Gridlines* tab and put a checkmark on *Major Gridlines of Value (Y) axis*.
  - d. Next click on the *Legend* tab and choose to have the legend appear at the bottom.

- Click on *Next* to go to *Step 4 of 4*. Click on the button next to *As Object In* for the chart to appear along with the spreadsheet numbers. Resize the chart so that it spans from G3 to N25. The chart should appear as shown in Figure 4.

Figure 4.

