# Recitation #9 – Week 03/22/2009 to 03/28/2009

## Chapter 12 – Behind the supply curve: inputs and costs

**Exercise 1.**

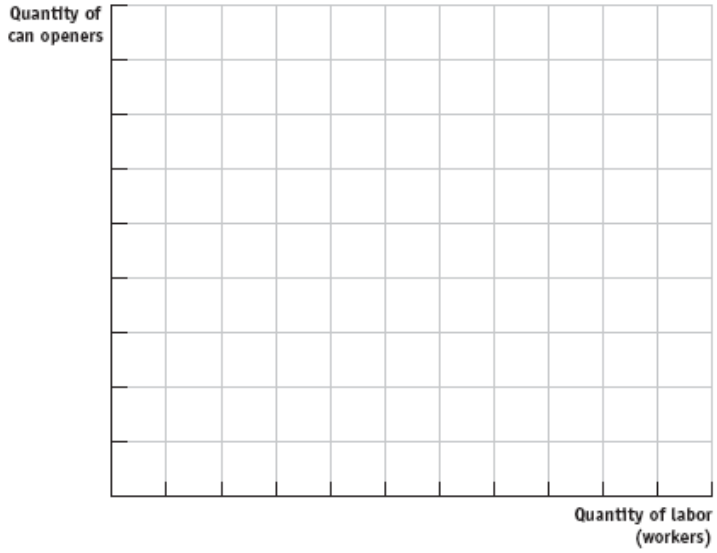
The following table describes the short-run production function for Harry's company. Harry uses labor and capital to produce can openers

| Quantity of labor (workers) | Quantity of capital (units) | Quantity of output (can openers) |
|---|---|---|
| 0 | 10 | 0 |
| 1 | 10 | 50 |
| 2 | 10 | 80 |
| 3 | 10 | 100 |
| 4 | 10 | 115 |
| 5 | 10 | 125 |
| 6 | 10 | 133 |
| 7 | 10 | 138 |

**a.** How do you know the above table represents Harry's short-run production function? How is the short run different from the long run?

**b.** Economists make a distinction between variable inputs and fixed inputs. For the above short-run production function, which input is the fixed input and which one is the variable input? Explain your answer.

**c.** Draw Harry's total product curve for the production of can openers, holding the level of capital constant. In your graph measure the quantity of labor on the *x*-axis and the quantity of can openers on the *y*-axis.

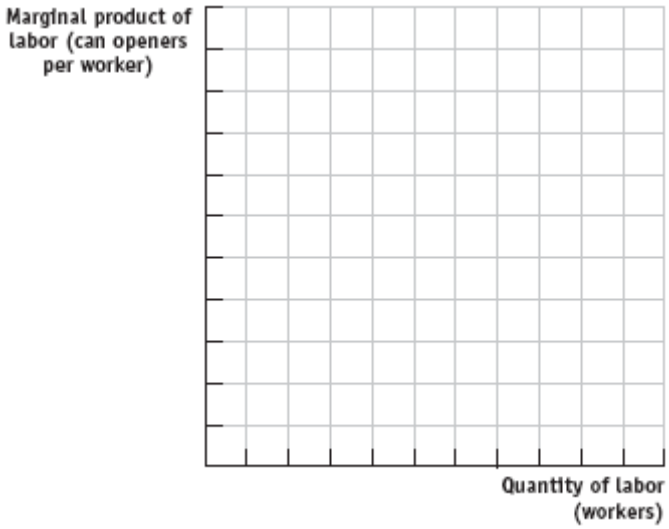



**d.** Complete the following table using the information given above and assuming that capital is held constant at 10 units.

| Quantity of labor (workers) | Quantity of output (can openers) | Marginal product of labor $MPL = \Delta Q/\Delta L$ (can openers per worker) |
|---|---|---|
| 0 | 0 | |
| | | 50 |
| 1 | 50 | |
| | | |
| 2 | 80 | |
| | | |
| 3 | 100 | |
| | | |
| 4 | 115 | |
| | | |
| 5 | 125 | |
| | | |
| 6 | 133 | |
| | | |
| 7 | 138 | |

**e.** Describe the results you found in part (d). What is the relationship between the quantity of labor used and the marginal product of labor at Harry's can opener factory?

**f.** Graph Harry's marginal product of labor on a graph with the quantity of labor measured on the *x*-axis and the marginal product of labor measured on the *y*-axis. Plot the marginal product values you found in part (d) using the midpoint method. For example, the marginal product of labor from hiring the first unit of labor is equal to 50can openers per worker: plot this information midway between 0 and 1 unit of labor.




**g.** What does it mean if the marginal product of labor curve is downward sloping as you hire more units of the variable input?

**Exercise 2**

The following table provides the short-run production function for Sherry's Hair Salon. Sherry uses only two inputs, labor and capital, to produce her output of stylish haircuts. The price of labor is $20 an hour and the price of capital is $50 per unit.

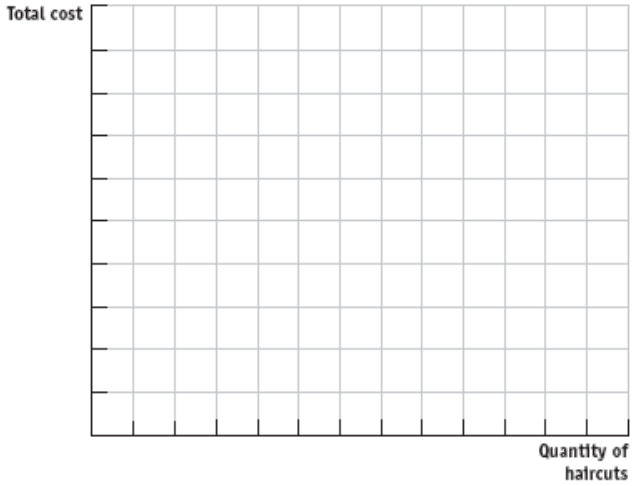
| Quantity of capital (units) | Quantity of labor (hours of work) | Quantity of haircuts |
|---|---|---|
| 10 | 0 | 0 |
| 10 | 10 | 15 |
| 10 | 20 | 28 |
| 10 | 30 | 38 |
| 10 | 40 | 44 |
| 10 | 50 | 48 |

**a.** Complete the following table of Sherry's costs given the above information. Round your calculations to one place past the decimal point.

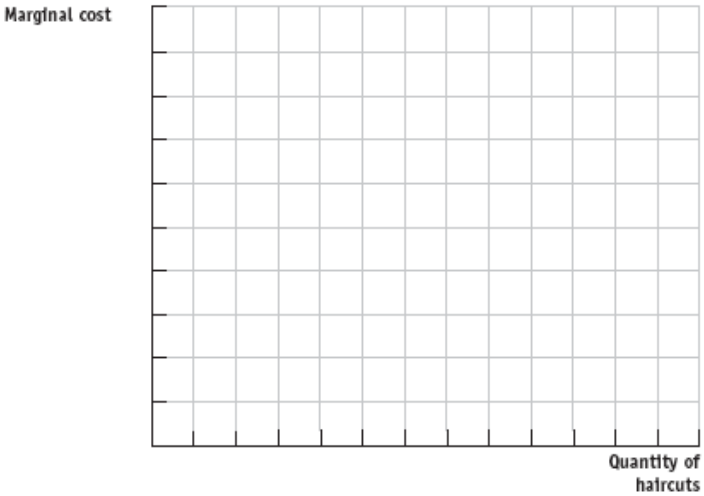
| Quantity of capital (units) | Quantity of labor (hours of work) | Quantity of haircuts | *FC* ($) | *VC* ($) | *AFC* ($) | *AVC* ($) | *ATC* ($) | *TC* ($) | *MC* ($ per unit of output) |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 0 | 0 | | | — | — | — | 500 | |
| | | | | | | | | | 13.3 |
| 10 | 10 | 15 | | | | | | | |
| | | | | | | | | | |
| 10 | 20 | 28 | | | | | | | |
| | | | | | | | | | |
| 10 | 30 | 38 | | | | | | | |
| | | | | | | | | | |
| 10 | 40 | 44 | | | | | | | |
| | | | | | | | | | |
| 10 | 50 | 48 | | | | | | | |

**b.** Does this production function exhibit diminishing marginal returns to labor? Explain your answer.

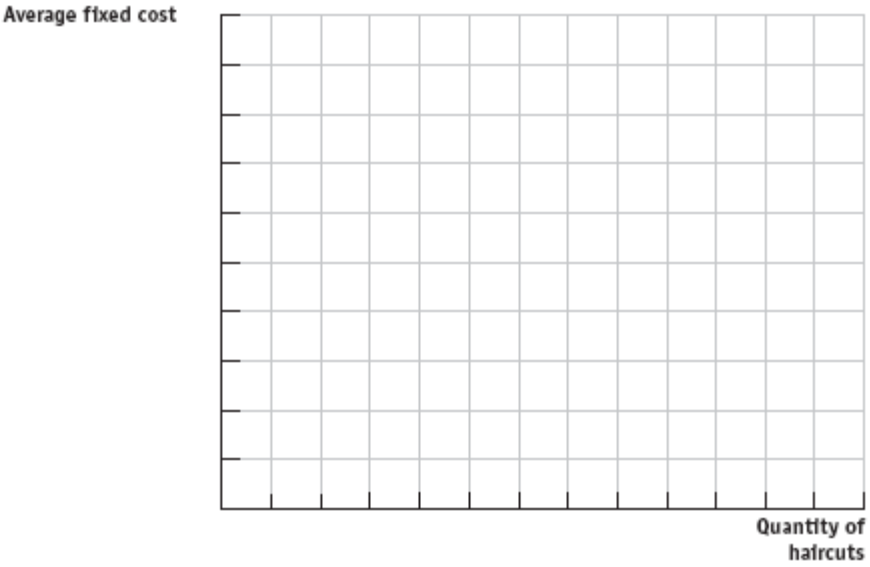
**c.** Graph the total cost function for Sherry's Hair Salon. Measure total cost on the vertical axis and the quantity of haircuts on the horizontal axis. Describe how increasing the quantity of haircuts affects the slope of the total cost curve.




**d.** Graph the marginal cost function for Sherry's Hair Salon using the midpoint method. Measure marginal cost on the vertical axis and the quantity of haircuts on the horizontal axis. Describe the slope of the *MC* curve and then explain why the *MC* is sloped this way.



**e.** In a new graph, draw Sherry's Hair Salon's *AFC* curve. Measure average fixed cost on the vertical axis and the quantity of haircuts on the horizontal axis. On your graph, indicate the area that corresponds to fixed cost if 15 haircuts are currently being produced.




**f.** In a new graph, sketch Sherry's Hair Salon's *ATC*, *AVC*, *AFC*, and *MC* curves. Measure cost per unit on the vertical axis and the quantity of haircuts on the horizontal axis. What must be true about the relationship between the *ATC* and *MC* curves?