

Chapter 13

1. Joe runs a small boat factory. He can make ten boats per year and sell them for €25,000 each. It costs Joe €150,000 for the raw materials (fibreglass, wood, paint, and so on) to build the ten boats. Joe has invested €400,000 in the factory and equipment needed to produce the boats: €200,000 from his own savings and €200,000 borrowed at 10 percent interest. (Assume that Joe could have loaned his money out at 10 percent, too.) Joe can work at a competing boat factory for €70,000 per year.

- a. What is the total revenue Joe can earn in a year?

Answer:

$$10 \times €25,000 = €250,000$$

- b. What are the explicit costs Joe incurs while producing ten boats?

Answer:

$$€150,000 + (€200,000 \times 0.10) = €170,000$$

- c. What are the total opportunity costs of producing ten boats (explicit and implicit)?

Answer:

$$€150,000 + (€400,000 \times 0.10) + €70,000 = €260,000$$

- d. What is the value of Joe's accounting profit?

Answer:

$$€250,000 - €170,000 = €80,000$$

- e. What is the value of Joe's economic profit?

Answer:

$$€250,000 - €260,000 = -€10,000$$

- f. Is it truly profitable for Joe to operate his boat factory? Explain.

Answer:

No. Joe could make €70,000 plus 10 percent interest on his €200,000 financial capital for a total of €90,000 if he worked for the competition instead of running his own factory. His factory makes an accounting profit of only €80,000 per year so it costs him €10,000 to run his own factory (the size of the economic loss).

2. Complete the following table. It describes the production and cost of hamburgers at a roadside stand. All figures are measured per hour.

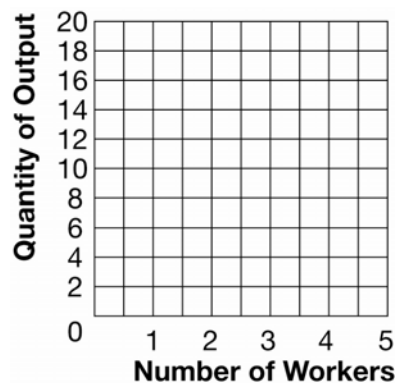
| Number of Workers | Output | Marginal Product of Labour | Cost of Factory | Cost of Workers | Total Cost |
|-------------------|--------|----------------------------|-----------------|-----------------|------------|
| 0 | 0 | | €25 | €0 | _____ |
| 1 | 6 | _____ | 25 | 5 | _____ |
| 2 | 11 | _____ | 25 | 10 | _____ |
| 3 | 15 | _____ | 25 | 15 | _____ |
| 4 | 18 | _____ | 25 | 20 | _____ |
| 5 | 20 | _____ | 25 | 25 | _____ |

Answer:

| Number of Workers | Output | Marginal Product of Labour | Cost of Factory | Cost of Workers | Total Cost |
|-------------------|--------|----------------------------|-----------------|-----------------|------------|
| 0 | 0 | | €25 | €0 | €25 |
| 1 | 6 | 6 | 25 | 5 | 30 |
| 2 | 11 | 5 | 25 | 10 | 35 |
| 3 | 15 | 4 | 25 | 15 | 40 |
| 4 | 18 | 3 | 25 | 20 | 45 |
| 5 | 20 | 2 | 25 | 25 | 50 |

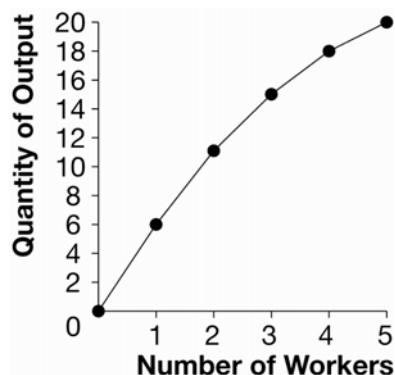
- a. Plot the production function in Exhibit 1.

Exhibit 1



Answer:
See Exhibit 4.

Exhibit 4



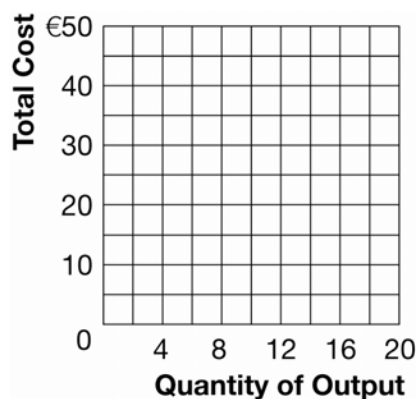
- b. What happens to the marginal product of labour as more workers are added to the production facility? Why? Use this information about the marginal product of labour to explain the slope of the production function you plotted above.

Answer:

It diminishes because additional workers have to share the production equipment and the work area becomes more crowded. The slope of the production function is the change in output from a change of one unit of input, which is the marginal product of labour. Since it is diminishing, the slope of the production function gets flatter as a greater number of inputs are used.

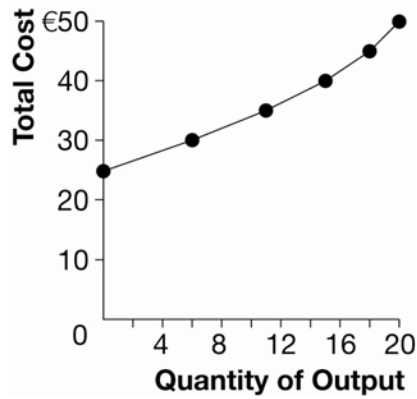
- c. Plot the total-cost curve in Exhibit 2.

Exhibit 2



Answer:
See Exhibit 5.

Exhibit 5



d. Explain the shape of the total cost curve.

Answer:

The total cost curve gets steeper as the quantity produced rises due to the diminishing marginal product of labour. That is, in order to produce additional equal increments of output the firm must employ ever greater amounts of inputs and costs rise at an increasing rate.

3. The information below is for Bob's blue jeans manufacturing plant. All data is per hour. Complete the table. Note the following abbreviations: FC (fixed cost), VC (variable cost), TC (total cost), AFC (average fixed cost), AVC (average variable cost), ATC (average total cost), MC (marginal cost).

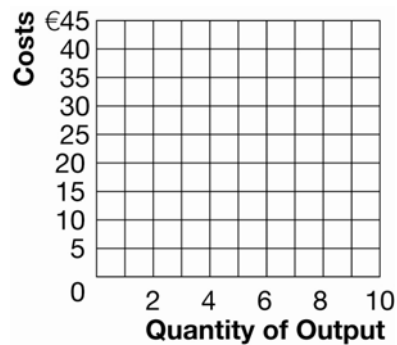
| Quantity | FC | VC | TC | AFC | AVC | ATC | MC |
|----------|-----|-----|-------|-------|-------|-------|-------|
| 0 | €16 | €0 | _____ | _____ | _____ | _____ | _____ |
| 1 | 16 | 18 | _____ | _____ | _____ | _____ | _____ |
| 2 | 16 | 31 | _____ | _____ | _____ | _____ | _____ |
| 3 | 16 | 41 | _____ | _____ | _____ | _____ | _____ |
| 4 | 16 | 49 | _____ | _____ | _____ | _____ | _____ |
| 5 | 16 | 59 | _____ | _____ | _____ | _____ | _____ |
| 6 | 16 | 72 | _____ | _____ | _____ | _____ | _____ |
| 7 | 16 | 90 | _____ | _____ | _____ | _____ | _____ |
| 8 | 16 | 114 | _____ | _____ | _____ | _____ | _____ |
| 9 | 16 | 145 | _____ | _____ | _____ | _____ | _____ |
| 10 | 16 | 184 | _____ | _____ | _____ | _____ | _____ |

Answer:

| Quantity | FC | VC | TC | AFC | AVC | ATC | MC |
|----------|-----|-----|-----|--------|--------|--------|-----|
| 0 | €16 | €0 | €16 | | | | €18 |
| 1 | 16 | 18 | 34 | €16.00 | €18.00 | €34.00 | 13 |
| 2 | 16 | 31 | 47 | 8.00 | 15.50 | 23.50 | 10 |
| 3 | 16 | 41 | 57 | 5.33 | 13.67 | 19.00 | 8 |
| 4 | 16 | 49 | 65 | 4.00 | 12.25 | 16.25 | 10 |
| 5 | 16 | 59 | 75 | 3.20 | 11.80 | 15.00 | 13 |
| 6 | 16 | 72 | 88 | 2.67 | 12.00 | 14.67 | 18 |
| 7 | 16 | 90 | 106 | 2.29 | 12.86 | 15.14 | 24 |
| 8 | 16 | 114 | 130 | 2.00 | 14.25 | 16.25 | 31 |
| 9 | 16 | 145 | 161 | 1.78 | 16.11 | 17.88 | 39 |
| 10 | 16 | 184 | 200 | 1.60 | 18.40 | 20.00 | |

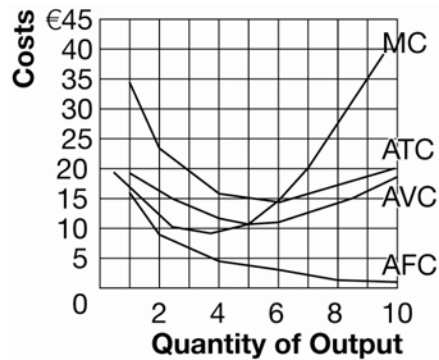
a. Plot AFC, AVC, ATC, and MC in Exhibit 3.

Exhibit 3



Answer:
See Exhibit 6.

Exhibit 6



- b. Explain the shape of each of the curves you plotted in part (a) above.

Answer:

AFC declines as the quantity goes up because a fixed cost is spread across a greater number of units. *MC* declines for the first four units due to an increasing marginal product of the variable input. *MC* rises thereafter due to decreasing marginal product. *AVC* is U-shaped for the same reason as *MC*. *ATC* declines due to falling *AFC* and increasing marginal product. *ATC* rises at higher levels of production due to decreasing marginal product.

- c. Explain the relationship between *ATC* and *MC*.

Answer:

When *MC* is below *ATC*, *ATC* must be declining. When *MC* is above *ATC*, *ATC* must be rising. Therefore, *MC* crosses *ATC* at the minimum of *ATC*.

- d. Explain the relationship between *ATC*, *AFC*, and *AVC*.

Answer:

AFC plus *AVC* equals *ATC*.

- e. What is Bob's efficient scale? How do you find the efficient scale? Explain.

Answer:

Six pairs of blue jeans. Efficient scale is the output that minimizes *ATC*. It is also the place where *MC* crosses the average total cost curve.