

IB - Managerial Economics
 Session 2 - Marginal Analysis

Discussion Questions

1. How does a firm determine the profit maximizing level of output?
2. How should a firm change a level of production if:
 - a. MR increases, while MC stays constant
 - b. MC increases, while MR stay constant
 - c. MR and MC increases
3. How should a firm determine the best level of (a) advertising? (b) input use? (c) investment?
4. a) How does the value of a businessperson's time affect his or her decision to fly or drive on a business trip? b) How much time should a consumer spend on shopping (searching) for lower prices? (c) For which type of good would you expect consumers to spend more time on comparative shopping or shopping for lower prices?

Problems:

1. Given the following total revenue function:

$$TR = 9Q - Q^2$$

- (a) Derive the total- revenue, average- revenue, and marginal- revenue schedules from $Q = 0$ to $Q = 6$ by 1's.
- (b) On the same set of axes, plot the total revenue, average revenue and the marginal revenue schedules of part (a).
- (c) With reference to your figure in part (b), explain the relationship between the total-, average- and marginal- revenue curves.

2. Given the following total cost schedule:

Q (no. of products)	1	2	3	4
TC (units)	12	14	15	20

- a) Derive the average- and marginal- cost schedules.
- b) On the same set of axes, plot the total-, average- and marginal- cost schedules of part (a).
- c) With reference to your figure in part (b), explain the relationship between the total-, average- and marginal- cost curves in part (b).

3. Given the following data on the marginal revenue and costs for the paints factory:

- a) Plot the marginal revenue and marginal costs schedules
- b) What is the level of production if the company seeks for the profit maximization?
- c) What is the level of production if the company seeks for the total revenue maximization?
- d) What would be the level of production for profit maximization if the marginal cost is higher by 30 units at each level of production?
- e) Assuming the increase of marginal revenue at each level of production by 34 units, what would be the production level if the company seeks for the profit maximization?

Production (No. Of units/week)	Marginal revenue (units)	Marginal cost (units)
0	72	17
1	56	15
2	40	25
3	24	40
4	8	60

4. **Decide about the optimum quantity of production, price and maximum profit**, given the following:

- Demand function for the good : $Q = 20 - 0,2P$
- Total cost function: $TC = 100 + 40Q$

Plot it on a graph

5. **Given the following:**

- price function (reverse function of demand): $P = 340 - 0,8Q$
- total cost function $TC = 120 + 100Q$

- Formulate the profit function
- Derive a formula that determines the dependence of marginal profit on the production volume ($M\pi$ function).
- Using the above formula find the optimum quantity of production
- Using the $MR = MC$ formula, find the optimum level of production. Next, using the reverse function of demand find the optimum price level.

6. **Given the following profit function** $\pi = -20 + 40Q - 5Q^2$

By using the marginal analysis, determine:

- Marginal profit function
- Marginal profit for $Q = 2$ and $Q = 6$
- The level of output at which the firm maximizes its total profit and the value of a maximum profit

7. **For the following total profit function of a firm:** $\pi = 144X - 3X^2 - XY - 2Y^2 + 120Y - 35$

Determine

- the level of output each commodity at which the firm maximizes its total profit;
- the value of the maximum amount of the total profit of the firm.

8. **Given the profit function being determined by price (P) and advertisement costs (A)**

$$\pi = 20 + 2P - 2P^2 + 4A - A^2 + 2PA$$

determine the optimum price level and the value of a maximum profit using marginal analysis method.

9. **Given the profit function :** $\pi = -120 + 240Q - 0,8Q^2$

Calculate the marginal profit on increase of the quantity produced from 99 units to 100 units

10. **A firm is producing one assortment (microchips) on one market. Microchips are sold in packages.**

Given the following:

Demand function	$Q = 8,5 - 0,05P$
Total cost function	$TC = 100 + 38Q$

- Determine the quantity and the price of a package of microchips to maximize profit. How much is the maximum profit?
- What happens if:
 - MC increases up to 46 units
 - Demand changes, changing MR function into: $MR = 190 - 40Q$
 - Both MC and MR increase?

11. **Suppose that** due to the price reduction made by foreign suppliers, the demand curve for the product of the domestic enterprise moves down by \$ 15. Does this mean that the domestic producer would now have to lower its price by \$ 15 to maintain its current sales volume? Is this price reduction an optimal solution?

Break Even Point - BEP

12. The XYZ company's assortment consists of three products X, Y and Z.

Based on the data contained in the table:

- Specify the amount of total revenue, total cost for each of the produced goods,
- Determine the profitability of particular products, calculating the total profit and profit per unit for each product
- Calculate the break-even point in terms of quantity and value for non-profitable goods assuming the current price
- Present the break-even point analysis on the chart

Specification	X	Y	Z
Sales volume	100	500	400
Price	80	100	50
Average variable cost	60	50	50
Fixed cost			
Insurance premium of the enterprise			10 000
Lease of production space			6 000
Depreciation			4 000

Breakdown of fixed costs:

Product X – 25%

Product Y – 25%

Product Z – 50%

- The XYZ company expects the possible increase of demand for the most profitable product. There are three options considered:
 - Increase of quantity produced by 20% using the free capacity of the production plant
 - Increase of the quantity produced, however the variable costs per unit will increase by 5% and it requires additional investment what will increase fixed costs by 12,5%
 - Increased demand allows for the increase in price by 20%

Choose the best option for the company considering profit maximization, profit per unit and level of costs.

13. Given the following information about the company

Fixed costs annually	€ 60.000
Price per unit	€ 20
Variable cost per unit	€ 10
Current sales:	8,000 units
Significant range *:	4,000 – 12,000 units

The significant range illustrates the levels of capacity utilization that the company has achieved in practice in the past and for which information about costs is available.

With the above data, specify:

- For what sales volume does the company reach the break-even point and how much is the break-even point?
- How many units should be sold in order to obtain a profit of € 30,000?
- What will the profit be if variable costs drop by 10% and fixed costs decrease by € 10,000, assuming that current sales can be maintained?
- What should be the sale price to achieve a profit of € 30,000 when selling 8,000 units?
- What additional quantity is required to be sold in order to cover an additional € 8,000 of fixed costs related to the planned investment in production plant?
- Please calculate the quantitative safety margin, the safety margin (at the value break-even point) and the percentage safety margin index