

Seminar 4.

Task 1. The demand function for a product is $D(p) = 1200 - 20p$, and the supply function $S(p) = 40p$, what is the number of goods sold at the equilibrium point?

Task 2. Due to unfavourable climatic conditions in Microland, it is very difficult to produce milk. Fortunately, world markets offer enough of it for \$1 per litre. The demand for milk Q is given by the inverse demand function $p = 3 - 0,1Q$.

- a) Draw the market equilibrium and mark the consumer's rent.
- b) The government has introduced subventions for milk consumers: now it costs only \$0.5. Draw market equilibrium, show consumer income, and compare the chart with the solution of point a).
- c) After the financial crisis, the government decided to deprive the people of the subvention and introduce a tax of \$0.5 per 1 litre. Draw the market equilibrium, show consumer income, and compare the chart with solutions a) and b).

Task 3. In the small remote village of Beerville, the demand function for beer is $D_1(p) = 12000 - 1000p$, the supply function is $S_1(p) = 2000p$.

- a) What is the price and quantity of beer sold at the equilibrium point?
- b) Foreign companies from Macroland have offered to build a free beer pipeline with the village of Macroville, where $D_2(p) = 12000 - 1000p$ and $S_2(p) = 0$. Determine how the price of beer in Beerville will change.
- c) City Hall has decided that all beer producers must pay compensation for their profits to the villagers. What should be the number of payments to compensate residents for the reduction in consumer rents?

Task 4. Taras buys 30 roses a month if the flowers are cheaper than 10 coins, and does not buy them more expensively. Peter buys 40 roses a month at a price of less than 8 coins and does not buy at higher prices. Build a graph of the total demand for roses.

Task 5. John's demand function is $Q_1 = 6 - 3p$, Mary's demand function is $Q_2 = 4 - 0,5p$. Construct the aggregate demand curve.

Task 6. The demand curve for a product is described by $Q = 270 - 4P$, and the supply curve is $Q = -18 + 8P$, where P is the price of the product, and Q is quantity. The government sets a subsidy to producers of 3 coins per unit.

- a) Find the equilibrium price and quantity before and after the introduction of the subsidy.
- b) Find the cost of the state to pay the subsidy. What will be the amount of subsidy related to consumers?
- c) Find the net loss of society as a result of the decision.

Task 7. There are only 7 men and 5 women on the market. The demand function for men $Q_1 = 6 - 3p$, women – $Q_2 = 4 - 0,5p$.

- a) Construct the aggregate demand curve.
- b) Find the change in demand when the price increases from 1 to 3 coins.
- c) Find the equilibrium market price if the aggregate supply is described by a formula $Q^S = 0,5 + 2p$.

Task 8. The company produces t-shirts using labour L and capital K .

- a) The production function has the form $y = KL$. Identify all combinations of engaging factors to produce 100 t-shirts.

- b) The company pays the workers $w = 4$, and the use of equipment is worth it $r = 1$. How much can a firm consume factors of production at total cost $C = 60$? Draw the corresponding isocosts.
- c) At what combination of factors costs for manufacturing 100 t-shirts are minimized?
- d) What will be the maximum level of production at maximum cost $C = 40$?
- e) How will this combination change if wages fall till $w = 1$?

Task 9. The company has two machines, the production costs are: $C_1 = y_1^2$, $C_2 = 5 + 2y_2^2$. Fixed costs are reduced to 0 if the machines are not involved in production.

- a) The company wants to produce 9 units. How to divide them between machines?
- b) The economic situation has deteriorated, so the company can sell only 3 units. How should they be produced now?

Task 10. The company's production is carried out according to the function $y = K^{0.5}L^{0.5}$. Capital assets are unchanged during the year $\bar{K} = 100$. The cost of maintaining a unit of capital and labour is 1 coin and 4 coins accordingly.

- a) Calculate the short-run total cost curve as well as the short-run average and marginal cost.
- b) What should be the price of the goods so that the company has no losses during the year? How many products will it produce at this price?

Task 11. The average costs of a competing firm, in the long run, are described by the formula $AC = 40 + 2Q$. How will the volume of production change by the company, if the price of products will decrease from 200 coins to 100 coins?

Task 12. The dependence of the total costs of the firm on output is shown in the table:

Q	0	10	20	30	40	50
TC	0	75	95	140	200	280

If the competitive price of the product is equal to 6 coins, what volume of production will the entrepreneur choose?

Task 13. The firm produces goods in conditions of perfect competition and sells them at a price $P = 14$. The cost function of the firm is $TC = 2Q + Q^3$. What volume of production maximizes the company's profit? Determines the amount of this profit.

Task 14. Total costs of a competing firm in the long run are $TC = 240q - 10q^2 + 5q^3$. Determine the level of equilibrium price of the firm's product in the long run.

Task 15. There are 10 identical companies on the market. How many firms can one of them join if the sales volumes of all the merged firms remain stable, and the law sets the maximum value of the Herfindahl-Hirschman index as 0.52?

Task 16. There are 20 identical companies in the industry. The total cost of each of them is determined by $TC = 0,2q^2 + 6q + 8$.

- a) Determine the value of fixed and variable costs of the firm.
- b) Determine the supply curve in the short term.
- c) Find the most efficient output for this firm.

Task 17. The firm produces goods in perfect competition and sells them at a price $P=12$. The total cost function of the firm is $TC = 2Q + 2Q^3$. At what output the company's profit will be maximum?

Task 18. Two types of resources are used in production - labour (L) and capital (K), the prices of which are 5 and 3 respectively. The production function has the form $F(K, L) = 2\sqrt{KL}$.

- a) Find the optimal output if the total cost is $TC = 20\sqrt{15}$.
- b) Find the minimum cost of production of 20 units.

Task 19. The average costs of a competing firm are described by the formula $AC = 40 + 2Q$. How will output change, if the price drops from 180 per piece to 120?

Task 20. The total cost function has the form $TC = 8Q + Q^2$. If a firm maximizes its profits by volume $Q^* = 14$ units, what is the market price of the product?

Task 21. The firm sells goods at market price $P = 14$, having the function of costs $TC = 2Q + Q^3$. Determine the maximum profit of the firm.

Task 22. Find the optimal output and price for the three companies that formed the cartel:

$$P = 108 - 2Q, TC(q_1) = 2q_1^2, TC(q_2) = 3q_2^2, TC(q_3) = 5q_3^2, Q = q_1 + q_2 + q_3.$$

Task 23. There are two oligopolistic firms in the market. Total demand is expressed by $Q = 2771 - 3p$, fixed costs of firms are equal to 0, $MC_1 = 17 + q_1$, $MC_2 = 45 + 0,9q_2$. Identify optimal strategies for oligopolists.

Task 24. There are two companies on the market. Market demand is given by the formula $p = 510 - 6Q$. The fixed costs of both firms are 0, the marginal costs of the first firm - 47, and the second - 13.

- a) Find the response function of the first firm and the response function of the second firm.
- b) Find the output and profit of each firm if the firms act as:
 - 1) duopoly;
 - 2) leader-follower;
 - 3) follower-leader;
 - 4) leader-leader;
 - 5) follower-follower.
- c) Find the Herfindahl-Hirschman index for all cases of the previous point.

Task 25. Consider a market in which two firms compete and set their output, the market demand curve is equal $Q = 4000 - 40P$. Firm 1 has fixed marginal costs $MC_1 = 20$, and firm 2 has fixed marginal costs $MC_2 = 40$. It is necessary to determine:

- a) the response function of each of the firms;
- b) equilibrium output and prices, using the Cournot model

Task 26. The cost function of the monopolist is $TC(y) = 19y^2$. Product demand function $y(p) = 120 - p$.

- a) Calculate the maximum profit of the monopolist.
- b) What price will the monopolist offer?

Task 27. Monopolist A produces goods y by technology $y = 2x$. The price factor x is $w = 16$. The monopolist probably knows the function of demand $y(p) = 20 - p$.

- 1) Calculate the number of goods that the monopolist will produce. What price will he offer? Show results graphically. How many factors x will the monopolist consume?
- 2) Determine the cost of producing the next unit of goods. Why won't the monopolist produce it, although the price is higher than the additional costs?
- 3) Determine the rent of the producer and consumer, and calculate the losses of society.
- 4) At what output the general rent is the maximum? How is it divided between seller and consumers?
- 5) What will be the rent of the producer if the monopolist has the opportunity for ideal price discrimination?

Task 28. Ferrari Corporation, the exclusive supplier of sports cars, is selling the new model for \$ 80,000. The price elasticity of demand is -5. The corporation has the opportunity to sell cars in China, but research shows that it requires a reduction in price by at least 15% (assuming arbitration is not possible).

- a) Let there be no restrictions on the production of machines with fixed marginal costs. Should a corporation use price discrimination?
- b) Let Ferrari not produce more cars than it does now. Should the corporation sell some of the cars in China?

Task 29. The cost function of the monopolist has the form $TC = 3Q^2$ and the demand curve for the product $P(Q) = 1200 - Q$.

- a) What is the price and output that maximize profits?

- b) What will be the actions of the monopolist, if he is subject to a tax of 50,000 or 100,000?
- c) What will the monopolist do if he has to pay a tax of 40 for each unit sold? What will be his profit?

Task 30. The sports complex seats 86,000 fans. Demand for tickets to football matches is for men $P_1 = 25 - \frac{Q_1}{5000}$, for women - $P_2 = 5 - \frac{Q_2}{5000}$. What ticket prices will be set by the administration of the complex if it uses 3rd type of discrimination to complete the complex?

Task 31. The monopolist firm sells its goods in two markets, the demand for which is determined by the equations: $P_1 = 200 - Q_1$, $P_2 = 190 - 3Q_2$. The cost function of the monopolist - $TC(Q) = 500 + 40Q$, where $Q = Q_1 + Q_2$.

- a) What are the prices and quantities that maximize the monopolist's profits if it operates in two markets?
- b) After the big scandal, all consumers learned that both markets sold the same product. What will be the general demand curve? What will be the prices, the volume of production of the monopolist and his profit?

Task 32. Selling cottages at 120 thousand coins, the monopolist firm maximizes its profits. If the price elasticity of demand is -1.5, then why will marginal cost and marginal revenue be equal?

Task 33. The monopolist can sell 10 units at 100 coins, but the sale of the 11th unit of goods causes a decrease in price to 99.5 coins. Why will the marginal revenue be equal when production changes?

Task 34. The firm produces goods under conditions of perfect monopoly. The demand function for this product is $P = 144 - 3Q$, the average cost function

$AC = \frac{25}{Q} + Q$. At what output Q will the maximum company profit?

Task 35. Price elasticity of demand for tickets for adults -2, for children -4. Ticket prices maximize the profits of the monopolist airline. Find the price of adult and children's tickets if the airline's marginal cost is \$ 60.

Task 36. The city has a single cinema, the total costs are $TC = 30 + 20Q$, where Q is the number of visitors. Demand for children's tickets is $q_1 = 20 - 0,5p_1$, for adults - $q_2 = 8 - 0,1p_2$. Find the best ticket prices for the cinema.

Task 37. The function of the total costs of the monopolist $TC = \frac{1}{2}Q^2 + 2Q$. The demand function for the company's product $P = 10 - \frac{1}{2}Q$. Find the price at which the company's profit is maximal, and define the degree of its monopoly power.

Task 38. Let the function of total costs be determined by the formula $TC(Q) = Q^2 + 60$, and the function of demand for goods $Q_D = 30 - 2P$. Find the volume of production, price, total revenue, economic profit and monopoly power.

Task 39. There are two companies in the market. The cost function of the first $TC_1 = 10 + 17q_1 + 1.4q_1^2$, second $TC_2 = 56 + 21q_1 + 1.6q_1^2$. The market demand function is given by the equation $P(Q) = 190 - 0.7Q$. Find the Herfindahl index for this economy if firms set output at the same time.