

Midterm 2

Full name:	
Student number:	Class:

- 1. This exam consists of two parts. Part A consists of 12 multiple-choice questions and is worth 10 points. Part B consists of 2 open questions and is also worth 10 points.
- 2. Part A must be completed in 50 minutes and Part B in the remaining 40 minutes.
- 3. Indicate your answers to part A with an "X" in the table below. Each correct answer is worth 10/12 (\approx 0.83) points and each wrong answer is penalized by (10/12) /3 (\approx 0.28) points.
- 4. Any kind of consultation is not allowed.
- 5. Turn off mobile phones, computers, tablets, and smartwatches. Their use will be considered fraud. The use of a non-graphical calculator is allowed.
- 6. Write your full name and student number on every answer sheet.
- 7. Return this answer sheet even if you withdraw from the exam.

1	2	3	4	5	6	7	8	9	10	11	12
а	а	а	а	а	а	а	а	а	а	а	а
b	b	b	b	b	b	b	b	b	b	b	b
С	С	С	С	С	С	С	С	С	С	С	С
d	d	d	d	d	d	d	d	d	d	d	d

ANSWER TABLE

English – Version A



2



PART A MULTIPLE CHOICE (10 points / 50 min)

1. In the natural gas market, low average extraction costs are achieved only through large-scale exploration, leading to the emergence of monopolies. Which of the following barriers to entry does not adequately explain the existence of monopolies in this type of market:

- a. Legal barriers that increase the fixed costs of gas extraction.
- b. Exclusive ownership to the natural resource.
- c. Economies of scale.
- d. Elasticity of demand for gas is low.

2. If a monopoly perfectly price discriminates, then the demand curve is ______ the marginal revenue curve, which results in _____ efficiency loss and _____ consumer surplus.

- a. coinciding with; maximum; zero
- b. coinciding with; zero; zero
- c. different from; zero; positive
- d. different from; minimum; positive

3. Which of the following statements is true for the case of a profit-maximizing monopolist that produces a positive quantity of output:

a. If marginal costs are zero, this level of output occurs when the price elasticity of demand is less than -1.

b. If marginal costs are zero, this level of output occurs when the price elasticity of demand is equal to -1.

c. If marginal costs are zero, this level of output occurs when the price elasticity of demand is bigger than -1.

d. Whatever the value of marginal cost, the price elasticity of demand is equal to -1.



4. Suppose Player 1 and 2 play a game. Each can choose two actions, blue and red. The combination of actions they choose lead to the payoffs in the matrix below. The first (second) number in each cell refers to the payoff of player 1 (player 2). Which statement is correct?

	Player 2					
		Blue	Red			
Player 1	Blue	5,5	6, 4			
	Red	8,7	2,8			

a. Player 1's dominant strategy is to play Blue.

b. The Nash equilibrium of this game is {Blue, Blue}.

<mark>c. This game has no Nash equilibrium in pure strategies but has an equilibrium in mixed</mark> strategies.

d. This game has no Nash equilibrium in pure and mixed strategies.

5. In the sequential game represented in the figure below, player 1 plays first and player 2 plays second. The first (second) number at the bottom of each final node refers to the payoff of player 1 (player 2). Which statement is correct?



a. The subgame perfect Nash equilibrium is {E; A} because it is a Nash equilibrium in all subgames of the game.

b. The subgame perfect Nash equilibrium is {E; A} because it rules out the credible threat strategy of player 1 choosing strategy DE.

c. The subgame perfect Nash equilibrium is {DE; A} because player 2 maximizes his payoff by not playing.

d. There is no subgame perfect Nash equilibrium.



6. If the prisoner's dilemma game is repeated a finite number of times, and the number of repetitions is known to both players, which of the following best describes the subgame perfect Nash equilibrium of the game?

- a. Both players choose to cooperate in every round.
- b. Both players choose to not cooperate in every round.
- c. Players corporate in the early rounds but stop cooperating in the final round.
- d. Players alternate between cooperation and non-cooperation throughout the game.

7. Two firms in an oligopoly produce a homogeneous good and face identical constant marginal costs. Assuming that price is the strategic variable and that there is no collusion, what will be the expected outcome in this market?

a. Firms set prices above marginal cost if they set prices simultaneously, but at the level of marginal cost if they set prices sequentially.

b. Firms set prices equal to marginal costs in a simultaneous and sequential game.

c. Firms set prices above marginal cost regardless of the sequence of decisions.

d. Firms engage in a price war, causing firms to exit the market in the long run due to negative profits.

8. In the Cournot model of competition in an oligopolistic market, what happens to the market equilibrium as the number of firms increases?

a. The market converges to a monopoly outcome, where firms set prices above marginal cost and restrict output.

b. Firms in this market begin to set prices equal to average cost, similar to monopolistic competition.

<mark>c. The market converges to the competitive outcome where price equals marginal cost, similar to perfect competition.</mark>

d. The market converges to the Bertrand outcome in which firms set prices above marginal cost and earn positive profits.

9. The graph below represents the quantities x to be produced by the incumbent firm (in blue) and entrant firm (in purple) against the fixed costs **FC** of market entry to be borne by the entrant in the sequential entry deterrence game. Knowing that the cost structure of the companies is identical, which of the following statements is false?



a. For sufficiently high entry costs FC, the entrant does not enter even if the incumbent produces the monopoly quantity x^M .

b. For sufficiently low entry costs FC, the deterrent output level to entry is so high that the incumbent prefers to allow entry and produce the Stackelberg leader quantity x^{SL} .

c. For intermediate entry costs $[\underline{FC}, \overline{FC}]$, the incumbent produces more than the monopoly output level x^{M} to deter entry by the entrant.

<mark>d. For a given level of fixed costs **FC**, the entrant firm enters the market and plays a Cournot</mark> game that results in asymmetric quantities produced by each firm.

10. Which of the following statements is true regarding the equilibrium in monopolistic competition?

a. In a monopolistic competitive equilibrium, firms outside the market (i.e., potential entrants) earn zero economic profits by entering the market.

b. In a monopolistic competitive equilibrium, incumbent firms (i.e., firms already active in the market) earn zero economic profits.

c. In a monopolistic competitive equilibrium, firms will enter the market indefinitely, even if incumbents are making losses.

d. In a monopolistic competitive equilibrium, firms produce at the output level corresponding to the minimum of average costs.



11. If two pizzerias open on a street that previously had none, each pizzeria will tend to locate ______ of the street rather than ______, and earn _____ profits, assuming the quality and price of pizza is the same.

- a. at the opposite end; in the middle; different
- b. three-quarters of the way from each end; in the middle; the same
- c. in the middle; at the opposite end; the same
- d. at opposite ends; three-quarters of the way from each end; the same

12. Which of the following statements best describes the relationship between innovation and monopolistic competition?

a. Firms in monopolistic competition have no incentive to innovate because entry into the market eliminates long-term profits.

b. Firms in monopolistic competition innovate to differentiate their products, which can create temporary market power and larger short-term profits.

c. Innovation is only relevant in monopolistic markets, since competitors do not gain any advantage from technological advances.

d. In monopolistic competition, firms guarantee permanent monopoly power and larger long-term profits through innovation.



PART B OPEN QUESTIONS (10 points / 40 min)

For the following two open questions, consider the fictional world containing three lands: Gondor, Mordor, and the Mines of Moria.

Question 1.

In Gondor, the sword production market is dominated by two companies: Company 1 and Company 2. The swords produced by both companies are identical.

Company 1 is located in an area with less access to the firewood needed for smelting furnaces and therefore has a higher production cost. In particular, the constant marginal costs of Company 1 and Company 2 are given by 30 and 20, respectively. Neither company has fixed costs.

The demand for swords in Gondor is given by the following function: q = 1000 - p, where q represents the total quantity of swords (i.e., $q = q_1 + q_2$) and p is the price of each sword.

a. Suppose that the firms compete according to the Cournot model. Determine the number of swords that maximize each firm's profit and the corresponding price. Justify your answer. (2p)

b. Now suppose firms compete according to the Stackelberg model, where Company 1 is the leader and Company 2 is the follower. Determine the number of swords that maximize each firm's profit and the corresponding market price. Justify your answer. (1.5p)

c. The children of the families associated with each company married each other, which made it possible to negotiate a collusion agreement (i.e., cartel) between the two. Determine the total number of swords each company produces when the cartel is in place, and the corresponding market price. State which company has the greatest economic incentive to break the cartel. Justify your answer. (1.5p)



Question 2.

The supply of iron from the lands of Gondor and Mordor is in the hands of a single company in the Mines of Moria. Its variable cost of extracting iron is given by c(y) = 3y, where y represents the quantity of iron. The company also bears a fixed cost of 20.

The inverse demand function for iron in *Gondor* is given by $p_G = 10 - 0.5y_G$, where p_G and y_G are the price and quantity in Gondor respectively. It is also known that the elasticity of demand ϵ_M for iron in *Mordor* is equal to $\epsilon_M = -3/2$.

a. Knowing that Gondor and Mordor are in conflict and that there is no possibility of reselling iron between them, determine the prices that the iron supplying company charges in each market. (Hint: for Morder, use the formula that $mr = p(1 + \frac{1}{\epsilon})$, where mr denotes marginal revenue). (2p)

b. For both Gondor and Mordor, determine the so-called markup ratio, which is defined as $\left(\frac{p-mc}{p}\right)$, where p is the price and mc are the marginal costs. Why would economists pay attention to this ratio? (1.5p)

c. Suppose Gondor conquers Mordor, and they become a single market. Explain in words the potential loss of efficiency when the iron supplying company acts as a single-price setting monopolist (i.e., unable to price discriminate), compared to a scenario where it acts like a monopolist that can third-degree price discriminate. (1.5p)



Question 1

a.

Company 1: TR=(1000-q1-q2)*q1 \rightarrow MR=1000-2q1-q2 \rightarrow max profits if MR=MC \rightarrow 1000-2q1-q2=30 \rightarrow solve for q1=485-0.5q2

Company 2: TR=(1000-q1-q2)*q2 \rightarrow MR=1000-q1-2q2 \rightarrow max profits if MR=MC \rightarrow 1000-q1-2q2=20 \rightarrow solve for q2=490-0.5q1

Obtain Nash equilibrium: q1=485-0.5q2=485-0.5*(490-0.5q1)=240+0.5q1 \rightarrow 0.75q1=240 \rightarrow q1=320 and q2=490-0.5*320=330 \rightarrow p=1000-320-330=350

b.

Use backwards induction. We know that follower will use BRF q2=490-0.5q1, and leader will use this to determine q1.

Leader (company 1): TR=(1000-q1-q2)*q1=(1000-q1-(490-0.5q1))*q1=(510-0.5q1)*q1 \rightarrow MR=510-q1 \rightarrow max profits if MR=MC \rightarrow 510-q1=30 \rightarrow q1=480 and q2=490-0.5*480=250 \rightarrow p=1000-480-250=270.

с.

Since FC1=FC2=0 and MC1>MC2, firm 2 will produce everything.

TR=(1000-q2)*q2 \rightarrow MR=1000-2q2 \rightarrow max profits if MR=MC \rightarrow 1000-2q2=20 \rightarrow q2=490 and q1=0 \rightarrow p=1000-0-490=510.

Company 1 and 2 will share the profits. Both have an incentive to break the cartel and produce, since for each firm *individually* we have that MR>MC. However, for firm 2 the MC are lower than for firm 1, so firm 2 has an even larger incentive to break the cartel.

Question 2

a.

Gondor: TR=p(y)*y=(10-0.5y)*y \rightarrow MR=10-y \rightarrow max profits if MR=MC \rightarrow 10-y=3 \rightarrow y=7 and p=10-0.5*7=6.5

Mordor: MR=p*(1+(1/e)) \rightarrow since e=-3/2 we have that MR=p(1/3) \rightarrow max profits if MR=MC \rightarrow p(1/3)=3 \rightarrow p=9



b.

The mark up ratio is defined is (p-mc)/p, so that for:

Gondor: (p-mc)/p=(6.5-3)/6.5=0.538 Mordor: (p-mc)/p=(9-3)/9=0.666

The markup ratio is a measure of market power: the higher it is, the more a firm is able to set prices above marginal costs and hence make profits. When the value approaches 0, p=mc, and the market approaches perfect competition.

с.

The loss of efficiency is smaller in the case where the monopoly can price discriminate. This happens because when there is price discrimination, the monopoly sells to more consumers in the market with greater elasticity of demand, hence it sells to consumers who would not buy in the case of a uniform pricing strategy.