

Version: A

Examination in Microeconomics A

Spring Term 2010

Handling of the exam

- Please check carefully whether your exam sheets are complete and correct, objections after the exam cannot be considered:
 - There are 2 **versions** of this exam, which are denoted by A and C respectively. Please check carefully, whether the version on the question sheet corresponds to the one on the solution sheet.
 - The **question sheet** (including the pages with the general remarks) consists of 8 pages. In addition there is a **solution sheet**, which consists of 3 pages.
- The use of resources other than a non-programmable calculator and at most one dictionary is not allowed. The use of other resources (e.g. programmable calculators, your own concept paper) leads to the disqualification from the exam.
- You have 120 minutes to solve the exam.
- The **exam** consists of 5 True- / False questions, each consisting of 5 subquestions, and 3 Text Problems again each consisting of 5 subquestions.
- For the True- / False- questions you have to decide whether a statement is true or false. For *each* subquestion you have to mark on the solution sheet whether the statement is true (T) or false (F). You will be awarded points according to the following rule: If your answer is correct, you will obtain *3 points* per statement. If your answer is wrong or if both answers are marked, you will obtain *0 points*. If no answer is given, then you will get *1 point*. For the True- / False- questions you can therefore obtain at most obtain 75 points.
- The **Text Problems** have, on the one hand, Multiple-Choice-subquestions (MC) with 5 answers provided for each question, where *exactly one of these answers is correct*. On the other hand, there are numerical subquestions (N), where you have to fill in a number on the solution sheet in encoded form. For each subquestion you get 5 points if answered correctly and 0 otherwise. For the Text Problems you can therefore at most obtain 75 points. Here is an example on how to encode integers in the numerical subquestions: Suppose the solution to the question is **503**. Then this number has to be filled in as follows:

Zahl Frage	100er	10er	1er
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Important: Mark the zero in the first column if the solution is a two-digit number. Similarly, mark the zero in the first and in the second column if the solution is a single-digit number.

- You will have passed the exam with certainty, if you obtain at least *70 points* or if you are among the 75% best participants of the exam.

Handling of the solution sheet:

- You **only** have to submit the solution sheet at the end of the exam. Answers on concept sheets or on the question sheet will not be considered. We recommend that you fill in the solutions at the **end of the exam** in order to avoid corrections. Please start to fill in your answers **at least 5 minutes before the end of the exam**. The supervisors have orders to collect the solution sheets, even if you have not yet filled in your answers.
- *Please fill in the whole circle, do not mark answers with a cross!* Only *unambiguously legible* solutions can yield points. Please do not use TippEx to correct your answers!
- You must sign your solution sheet at the bottom, otherwise your exam is not **valid**.
- If you do not wish that we publish your registration number, your points and your expected mark on our homepage, you have to mark the respective field on the solution sheet. If you mark this field, you have to wait for your grade until it is announced by the "Studienbüro", which may take some time.

Concerning the content of the exam

1. Assume that the "Ceteris-Paribus" condition holds. This means that all variables that are not explicitly changed remain constant. If we ask for example about the effects of the change of one variable (e.g. p_1), you have to assume that the other variables (e.g. p_2) remain constant, unless explicitly stated otherwise.

2. If we say that a variable (e.g. p_1) is changed, we mean a marginal change that is strictly different from zero, unless explicitly stated otherwise.
3. Assume infinitely divisible goods, unless explicitly stated otherwise.
4. Assume strictly positive and finite prices and income.
5. Assume that consumers maximize their utility and firms maximize profit.
6. Market demand functions are always weakly decreasing, market supply functions are weakly increasing.

Good luck!

1 True-/False questions

1.1 A consumer consumes apples (A) and bananas (B). Her preferences are given by the utility function $u(x_A, x_B) = \sqrt{2x_A + 4x_B}$, where x_i , $i = A, B$, are the consumed quantities. Which of the following statements are true?

- a The consumer optimally spends twice as much on bananas as on apples.
- b The consumer optimally consumes twice as many bananas as apples.
- c If the prices of apples and bananas satisfy $p_B = 2p_A$ then the consumer will consume exactly as many apples as bananas.
- d If the price of apples decreases, then the consumer will consume more apples.
- e If the consumer becomes richer, she will consume more apples.

1.2 Consider consumption and production in the competitive market for peanuts. We assume that all consumers i have quasi-linear utility functions $u^i(x_P, m) = v^i(x_P) + m$, where x_P is the quantity of peanuts consumed by the consumer and m her consumption of all other goods. We also assume that all v^i are increasing and strictly concave and that consumers consume strictly positive amounts of all other goods, i.e. $m > 0$ for all consumers i . Each firm j produces peanuts with the cost function $C^j(q)$ where q is the quantity of peanuts produced by the firm. The C^j are strictly convex. Which of the following statements are true?

- a If one consumer is forced to transfer a marginal, i.e. very small, part of her income to another consumer, the aggregate demand for peanuts does not change.
- b In a competitive equilibrium in the peanut market, the total producer surplus is maximized.
- c In a competitive equilibrium in the peanut market, the total consumer surplus is maximized.
- d If an allocation in the peanut market is a welfare maximum, it is a Pareto optimum.
- e If an allocation in the peanut market is a Pareto optimum, then there is a price such that the allocation constitutes a competitive equilibrium.

1.3 Consider a firm with production function $f(x_1, x_2)$, where x_1 and x_2 are the inputs. In the long run both inputs can be varied, in the short run input 1 is fixed. Which of the following statements are true?

- a The long-run average costs are weakly lower than the short-run marginal costs.
- b The short-run marginal cost curve intersects the long-run average cost curve in the latter's minimum.
- c The more firms enter the market, the flatter the marginal cost curve becomes (here the output is depicted on the horizontal axis of the diagram).
- d If the technology of a firm satisfies $f(tx_1, tx_2) > tf(x_1, x_2)$ for all $t > 1$, then this implies that the long-run average costs decrease in output.
- e Let x_1^0 and x_2^0 be the conditional factor demands for the output level y . The technology of the firm satisfies $f(tx_1, tx_2) = tf(x_1, x_2)$ for all $t > 1$. Statement: The cheapest way to double the output y is to double the inputs x_1^0 and x_2^0 .

1.4 Consider a market in which the market demand is strictly decreasing and the market supply is strictly increasing. Both functions are continuous. Which of the following statements are true?

- a There exists at least one market equilibrium.
- b A benevolent social planner can always strictly increase welfare compared to an equilibrium allocation in a competitive market by choosing a different allocation.
- c If the agents are exclusively self interested, then the resulting equilibrium allocation in a competitive market cannot maximize welfare.
- d Each allocation which maximizes consumer surplus is Pareto-optimal.
- e If the traded quantity is larger than the equilibrium quantity, then the production costs of the last unit produced exceed the consumers' maximum willingness to pay for this unit.

1.5 A consumer plans her consumption for 3 periods $t = 1, 2, 3$. In periods 1 and 3 she has the respective income $Y_1 = Y_3 = Y$, in period 2 she has no income, i.e. $Y_2 = 0$. Her utility function is given by $U(c_1, c_2, c_3) = c_1 + \delta c_2 + \delta^2 c_3, 0 < \delta < 1$. Which of the following statements are true?

- a If the consumer lives in autarky, then $c_2 = (Y_1 + Y_3)/2$.
- b If the consumer cannot borrow but can save, then $c_3 = Y_3$.

Suppose in the following that the consumer faces a perfect capital market. She can save or borrow between two periods at the uniform interest rate $r > 0$.

- c If the consumer faces a perfect capital market, then she is weakly better off compared to the case where she can save but cannot borrow.
- d If δ is sufficiently small, then the consumer borrows in period 1.
- e Suppose now as in the previous parts of this problem that the consumer plans his optimal consumption in period 1 for all 3 periods and consumes accordingly in period 1. After period 1 the interest rate increases unexpectedly to $r' > r$. In period 2 the consumer adjusts her optimal plan accordingly. Statement: At the new optimum the consumer strictly increases c_3 .

2 Text Problems

Problem 2.1 Consider a firm that operates in a competitive market with average cost function $AC(q) = \frac{1}{4}q + 14 + \frac{36}{q}$. Assume that in the short run fixed costs must be paid regardless of whether the firm wants to shut down or not.

2.1.1 (N) If the current market price is 18 and is expected to remain so in the long run, what is the firm's optimal output in the short run? Calculate and state it rounded to integer numbers.

2.1.2 (N) If the current market price is 18 and is expected to remain so in the future, what is the firm's optimal output in the long run? Calculate and state it rounded to integer numbers.

2.1.3 (N) If the current market price is 24 and is expected to remain so in the long run, what is the firm's optimal output? Calculate and state it rounded to integer numbers.

2.1.4 (N) If the current market price is 12 and is expected to rise to 24 permanently in the future, what is the firm's optimal output in the short run? Calculate and state it rounded to integer numbers.

2.1.5 (N) What is the firm's producer surplus if the market price is 24? Calculate and state it rounded to integer numbers.

Problem 2.2 Consider a country in which all inhabitants have the same utility function $U(C, F) = \sqrt{C} + 3\sqrt{F}$, where C denotes the monthly quantity of consumption of goods and services and F the monthly amount of leisure consumed (in hours). The price of consumption (C) is $p = 1$, the price of leisure (relative to all other consumption) is given by the market wage rate w . The monthly income for each inhabitant is his labor income $w(T - F)$, where the monthly total time budget per inhabitant is $T = 450$ hours, which individuals can freely allocate to leisure and work. The country has 30 inhabitants.

2.2.1 (N) If the wage is $w = 2$, what is the elasticity of the aggregate supply of labor? State the answer rounded to integer numbers.

2.2.2 (N) The demand for labor in our country is given by $L^D(w) = 54\,000/(w + 4)$ hours per month. In equilibrium, how many hours does each inhabitant work per month? State the answer rounded to integer numbers.

2.2.3 (N) Because the labor market is considered unsatisfactory, the government imposes a minimum wage of $w = 5$. How many hours does each inhabitant now work in equilibrium (hours per month)? State the answer rounded to integer numbers.

2.2.4 (N) Because of wide-spread union protests, the government raises the minimum wage to $w = 14$. If each inhabitant works the same amount of hours, how many hours does each inhabitant now work (hours per month)? State the answer rounded to integer numbers.

2.2.5 (N) In the situation of part 2.2.4, suppose now that each inhabitant either works his preferred number of hours at the given wage, or he does not work at all (i.e. is unemployed). How many people will be employed? State the answer rounded to integer numbers.

Problem 2.3 Hugo consumes exclusively the two goods 1 and 2. The quantities consumed are x_1 and x_2 , respectively. He maximizes his utility $u(x_1, x_2) = 5x_1x_2^2$ for a given income $Y = 500$ and given prices p_1 and $p_2 = 15$.

2.3.1 (MC) Exactly one of the following statements is true.

- a If p_1 is sufficiently high compared to p_2 , then Hugo consumes exclusively good 2.
- b If Y is sufficiently high, then Hugo does not spend his entire income on consumption.

- c Hugo's preferences are weakly monotonic.
- d Good 1 is an inferior good.
- e None of the above four statements is correct.

2.3.2 (N) What is Hugo's demand for good 1 at $p_1 = 10$? State the answer rounded to integer numbers.

2.3.3(N) Suppose exclusively in this part of the problem that the government imposes a quantity tax of $t = 1$ per unit of good 1. What is the new demand for good 1? State the answer rounded to integer numbers.

2.3.4 (N) Consider again the situation of part 2.3.2. Suppose, the price of good 1 increases to $p'_1 = 15$. Determine Hugo's income such that he obtains the utility level 25000. State the answer rounded to integer numbers.

2.3.5 (N) Determine the substitution effect (according to Hicks) with respect to good 1 that arises due to a price increase from $p_1 = 10$ to $p_1 = 15$. State the absolute value of the substitution effect rounded to integer numbers.