

Version: A

Repeat exam 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"/>

Figure 1:

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 TippiEx 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 Assume that a consumer has to decide on an optimal consumption bundle in a world with 2 goods. The consumer has an endowment in which both goods are included with strictly positive amounts. He does not have an additional income. The price of good 1 decreases from p_1^0 to p_1^1 . Which of the following statements are true?

- a After the price decrease the consumer is better off than before the price decrease.
- b The direction of the substitution effect according to Slutsky depends on the size of the endowment effect.
- c The direction of the income effect according to Slutsky does not depend on how much the price of good 1 decreases.
- d If the utility function of the consumer is $u(x_1, x_2) = \min(2x_1, x_2)$, then the absolute value of the income effect according to Slutsky is strictly larger than the absolute value of the substitution effect according to Slutsky.
- e The size of the endowment effect does not depend on whether the decomposition of the demand change is conducted according to Hicks or to Slutsky.

1.2 Consider an exchange economy with 2 goods and 2 consumers, in which each of the two consumers has an endowment with strictly positive amounts of both goods. Which of the following statements are true?

- a Each allocation on the contract curve is Pareto-efficient.
- b Each allocation on the contract curve maximizes the sum of the consumers' utilities.
- c The consumers' indifference curves, which intersect the contract curve in a particular point, have the same slope (in absolute terms) at this point.
- d If there exists a general equilibrium with prices p_1 and p_2 for a particular endowment e , then there is an infinite number of other endowments for which the prices p_1 and p_2 are also equilibrium prices.
- e If the consumers have identical preferences, then each consumer consumes the same amount of good 1 and good 2 in the general equilibrium.

1.3 Consider the market for a homogenous good. The market is competitive (and in particular has an equilibrium in which strictly positive amounts of the goods are traded). The government introduces a quantity tax t such that $t > 0$ per unit sold or bought has to be paid to the tax authority. Which of the following statements are true?

- a** If the tax is collected from the consumers, then the producers bear a smaller economic tax burden than the consumers.
- b** With an unit elastic supply the introduction of a tax rate t increases the quantity that is demanded in equilibrium the more, the higher the elasticity of the demand is.
- c** The tax revenue of the government can be equal to zero.
- d** If demand is perfectly inelastic and the tax is collected from the producers, then the consumer price increases the more, the higher the elasticity of supply is.
- e** In this part of the problem the supply and the demand function are assumed to be linear and have the same slopes in absolute terms. If t is sufficiently small, then producers and consumers bear the same amount of the tax burden.

1.4 Consider a firm that produces a single output with the production function $f(x_1, x_2) = x_1^{0.6}x_2^{0.6}$, where x_1 and x_2 are the quantities of input 1 and 2, respectively. It operates in competitive markets and takes the price of output, p , and the price of the inputs, $p_1 = p_2 = 3$, as given. Which of the following statements are true?

- a** The firm has increasing returns to scale.
- b** The firm has increasing long-run average costs.
- c** The firm's long-run marginal cost function has a unique minimum.
- d** If the firm can vary both inputs freely, it chooses an output quantity given by the condition $5q^{-1/6} = p$.
- e** If input 2 is fixed at $x_2 = 1$, the firm's short-run marginal cost function is $MC(q) = 5\sqrt[3]{q^2}$.

1.5 Mr. X plans his consumption for two periods, $t = 0, 1$. His utility function over consumption (c_0, c_1) in these two periods is $u(c_0, c_1) = c_0^a c_1^b$, with $a, b > 0$, and he has income $Y_0 > 0$ in period 0 and income $Y_1 > 0$ in period 1. In period 0, he can borrow and save at the interest rate $r > 0$. Denote his optimal consumption choice by (c_0^*, c_1^*) . Which of the following statements are true?

- a** If $a > b$, then Mr. X consumes more in period 0 than in period 1.
- b** If $Y_1 = Y_0$, then Mr. X borrows a strictly positive amount.
- c** If $a = b$ and $Y_1 = Y_0$, then $c_1^* > c_0^*$.
- d** If r increases, c_1^* increases.
- e** If r increases and if Mr. X saves in the optimum, c_0^* can increase.

2 Text Problems

Problem 2.1 Suppose that market demand is given by

$$D(p) = 100 - 2p$$

and the supply of a single firm is given by

$$s(p) = 2p.$$

There are no fixed costs. The time dimension in this problem refers to the number of firms in the market. In the short run there are 9 identical firms in the market. In the long run firms may enter the market. All firms in this market are identical. Each firm in the market has to pay a fee $G \geq 0$ to the government, which is independent of the amount sold. A firm which leaves the market does not get the fee back. Hint: Think about the role that the fee plays in the firm's decision to enter or to leave the market.

2.1.1 (N) Determine the short run equilibrium price. State the price rounded to integer numbers.

2.1.2 (N) Determine a firm's short run equilibrium profit before the fee (i.e. before the fee is paid). State the profit rounded to integer numbers.

2.1.3 (N) Determine the consumer surplus in the short run. Divide the calculated number by 5 and state the result rounded to integer numbers.

2.1.4 (N) Let $G = 4$. Determine the number of firms in the market in the long run. State this number.

2.1.5 (N) Assume that $G \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Determine the G within this set which maximizes the consumer surplus in the long run.

Problem 2.2 A firm's production possibilities are described by the following function: $y = x_1^{0.5} + x_2^{0.5}$. Here x_1 is the amount of input 1 and x_2 is the amount of input 2; y is the maximum possible amount of the produced product.

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

- a The firm's technology exhibits increasing returns to scale.
- b The firm's technology exhibits decreasing returns to scale.
- c The firm's technology exhibits constant returns to scale.
- d The inputs 1 and 2 are perfect substitutes.
- e None of the above four statements is correct.

2.2.2 (N) Determine the absolute value of the slope of the isoquant at the point $(x_1, x_2) = (4, 64)$ and state the answer rounded to integer numbers.

2.2.3 (N) The price per unit of input 1 is $w_1 = 45$, the price per unit of input 2 is $w_2 = 50$. The firm wants to produce $y = 10$ units of the product at the lowest costs possible. How many units of input 2 are used? State the answer rounded to integer numbers.

2.2.4 (N) The firm has committed itself to purchase at least 25 units of input 1 from a supplier. For these 25 units the firm obtains a discount of 20 percent on the price $w_1 = 45$. The firm may only use the input for production and may not sell it on the input market. If the firm wants to use more than 25 units of input 1, then it must pay the regular price $w_1 = 45$ (i.e. without discount) for each additional unit. How many units of input 2 uses the firm if it wants to produce $y = 10$ units of the product at the lowest possible costs? (The price per unit of input 2 is still $w_2 = 50$.) State the answer rounded to integer numbers.

2.2.5 (N) Consider again the situation without the discount. Therefore there is no obligation to take delivery and the firm pays the price $w_1 = 45$ per unit of input 1 and the price $w_2 = 50$ per unit of input 2. Assume that the firm can sell its product at the price $p = 200$ per unit. Determine the firm's profit if it chooses y optimally. State the answer rounded to integer numbers.

Problem 2.3 The preferences of two persons, A and B , are given by:

$$u^A(x_1^A, x_2^A) = 2x_1^A x_2^A \quad \text{and} \quad u^B(x_1^B, x_2^B) = x_1^B x_2^B$$

where u^j is the utility of agent j and x_i^j is the consumption of good i by agent j . The agents' endowments are given by

$$\begin{aligned} e_1^A &= 3, & e_2^A &= 10 \\ e_1^B &= 12, & e_2^B &= 20. \end{aligned}$$

The agents trade with each other as if they were on a competitive market, i.e. they consider the prices p_1 and p_2 as given. In the following calculations, make sure that intermediate results are accurate to 4 decimal places.

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

- a The allocation $(x_1^A, x_2^A, x_1^B, x_2^B) = (5, 5, 7, 7)$ is an element of the Edgeworth Box.
- b The contract curve is a straight line.
- c The allocation $(x_1^A, x_2^A, x_1^B, x_2^B) = (7, 8, 11, 12)$ is feasible.
- d The above endowments are Pareto-efficient.
- e None of the statements (a)-(d) is correct.

2.3.2 (N) Determine agent A 's equilibrium consumption of good 1 and state this quantity rounded to integer numbers.

2.3.3 (N) How many units of good 1 are sold by agent B in equilibrium? State this quantity rounded to integer numbers.

2.3.4 (N) Determine agent B 's equilibrium utility and state it rounded to integer numbers.

2.3.5 (N) Agent A destroys four units of good 2 and agent B destroys two units of good 1 before the agents interact in the market. Determine agent A 's consumption of good 1 in the general equilibrium. State this quantity rounded to integer numbers.