

Version: A

Examination in Microeconomics A

Spring Term 2009

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 firm produces one output by means of a continuously differentiable, strictly increasing, strictly convex cost function that has strictly positive fixed costs. Which of the following statements are true?

- a The firm's variable cost of producing q units is equal to the integral over all its marginal costs between 0 and q .
- b The minimum of the average variable cost curve lies to the left of the minimum of the average cost curve.
- c Marginal costs are strictly larger than marginal variable costs. (Hint: Let VC be the variable costs. The marginal variable costs are defined as $\frac{dVC}{dq}$.)
- d For the first (marginal) unit produced, marginal cost equals average variable cost.
- e The marginal cost curve intersects the average variable cost curve at its minimum.

1.2 Which of the following features tend to render a market more competitive?

- a Firms operate with increasing returns to scale.
- b Firms can communicate well through cartels.
- c The product sold in the market is homogenous.
- d Entry into the market is costless.
- e There are many firms in the market.

1.3 Consider a consumer with preferences concerning the quantities x_1 and x_2 of two goods. Which of the following statements are true?

- a If the consumer's preferences are strictly monotone, then there is no utility function representing these preferences with the property that at least one level curve is a circle.
- b If there exists a utility function that represents the consumer's preferences, then there is an infinite number of other utility functions that represent the consumer's preferences.

- c Whether the consumer considers the goods as substitutes or complements depends on his budget.
- d Assume that the consumer has the utility function $u = (x_1x_2 - 10)^2$. Statement: The preferences of the consumer satisfy strict monotonicity.
- e Assume that the following holds for the consumer:

$$(x'_1, x'_2) \succ (x''_1, x''_2) \text{ if and only if } x'_1 - x'_2 > x''_1 - x''_2 \text{ and}$$

$$(x'_1, x'_2) \sim (x''_1, x''_2) \text{ if and only if } x'_1 - x'_2 = x''_1 - x''_2.$$

Statement: The utility function $u = (x_1 - x_2)^2$ represents the consumer's preferences.

1.4 A consumer plans his consumption for 2 periods $t = 0, 1$ and has the utility function $u(c_0, c_1) = U(c_0) + U(c_1)$, where the function U is strictly monotonic, strictly concave and is defined on \mathbb{R}_+ . In period 0 he has income Y_0 and in period 1 his income is Y_1 . The consumer may save on the capital market at the rate $r_S \geq 0$ or borrow at the rate $r_K \geq 0$. Which of the following statements are true?

- a If $Y_0 > 0$ and $Y_1 = 0$, then the consumer borrows.
- b Assume in this subquestion that $r_S = r_K = r$. Assume that the consumer saves at the optimum if the interest rate is $r = \bar{r}$. Statement: If the interest rate decreases (marginally), then it is possible that the consumer borrows instead of saving.
- c Assume again that $r_S = r_K = r$. Assume that the consumer borrows at the optimum if the interest rate is $r = \bar{r}$. Statement: If the interest rate increases (marginally), then optimal consumption in $t = 0$ decreases.
- d If borrowing is more expensive than saving, i.e. $r_K > r_S$, then the consumer always saves.
- e If $r_k = r_S > 0$, then, at the optimum, consumption in $t = 0$ is smaller than consumption in $t = 1$.

1.5 A consumer's preferences can be represented by the utility function $u(x_1, x_2)$, which is strictly increasing in x_1 and x_2 . Her income is $Y > 0$. Which of the following statements are true?

- a If good 2 is inferior, then the demand for good 2 is increasing in the consumer's income Y .

- b** The income-consumption curve has a positive slope.
- c** Assume that the price of good 1 increases to $p'_1 > p_1$. Statement: If $u(x_1, x_2)$ is concave in x_1 and x_2 , then the demand for both goods decreases.
- d** Consider a change of the price p_1 to $p'_1 > p_1$. Let Y' be the income such that the consumer at prices (p'_1, p_2) is just able to afford the bundle that she purchased at prices (p_1, p_2) . Let x'_1 be the quantity of good 1 that the consumer purchases at prices (p'_1, p_2) , if her income is Y' . Statement: The difference between x'_1 and x_1 is the Slutsky substitution effect.
- e** In the situation of subquestion d, the difference $x'_1 - x_1$ is strictly positive if good 1 is inferior.

2 Text Problems

Problem 2.1 Consider a competitive market with 20 identical firms who in the short run all operate with the cost function $C(q) = 2q^2 + 4q + 0.25$. Demand in this market is given by $D(p) = 22 - 2p$. In the short run there is no market entry.

2.1.1 (N) Calculate the equilibrium market price and state it rounded to integer numbers.

2.1.2 (N) Calculate consumer surplus in equilibrium and state it rounded to integer numbers.

2.1.3 (N) Calculate producer surplus and state it rounded to integer numbers.

2.1.4 (N) Calculate the total profit of all firms in equilibrium and state the value rounded to integer numbers.

2.1.5 (MC) Assume that in the long run, there are many firms who are ready to enter the market and can do so at no cost. Exactly one of the following answers is correct. In the long run,

- a** because of fixed costs, there will be no entry.
- b** fixed costs force at least one firm to leave the market (stop producing).
- c** a positive but finite number of firms enters the market.

d the number of firms entering the market goes to infinity.

e None of the above answers is correct.

Problem 2.2 Investor Heinz has the money utility function

$$U = \ln Y$$

where \ln is the natural logarithm. He faces the following risk:

$$y = \begin{cases} 8 & \text{with probability } \frac{1}{2} \text{ (state 1)} \\ 2 & \text{with probability } \frac{1}{2} \text{ (state 2)} \end{cases}$$

i.e. in state 1 the realization of y is equal to 8 and in state 2 the realization of y is equal to 2. In addition, Heinz has a certain income of 10.

2.2.1 (N) Determine Heinz's expected utility. State the answer rounded to integer numbers.

In the following subquestions Heinz may purchase an asset on the capital market. The asset's payoff is as follows:

$$x = \begin{cases} 4 & \text{with probability } \frac{1}{2} \text{ (state 1)} \\ 6 & \text{with probability } \frac{1}{2} \text{ (state 2)} \end{cases}$$

i.e. in state 1 the realization of x is equal to 4 and in state 2 the realization of x is equal to 6.

2.2.2 (N) Determine the expected value of the payoff of one unit of the asset. State the answer rounded to integer numbers.

2.2.3 (N) Determine the maximum price that Heinz is willing to pay for one unit of the asset. Round this number to the first decimal place and multiply this rounded number by 10. State the calculated number on the solution sheet. (Example: If the calculated maximum price is equal to 6.3869, then put 64 in the solution sheet.) Make sure that intermediate results are accurate to 4 decimal places.

2.2.4 (N) Now Heinz may purchase as many units of the asset as he likes. How many units of the asset does he have to purchase in order to be no longer exposed to any uncertainty? State the answer rounded to integer numbers.

2.2.5 (MC) Exactly one of the following statements is correct.

- a Heinz is risk loving.
- b The expected value of x is strictly higher than the expected value of y .
- c The variance of x is higher than the variance of y .
- d If Heinz purchases one unit of the asset as in subquestion 2.2.3, then the variance of his total wealth is smaller than in the cases where he does not purchase the asset.
- e None of the above four answers is correct.

Problem 2.3 Ekim's preferences for the consumption of two goods can be represented by the utility function $u(x_1, x_2) = x_1x_2$. The prices for the goods are p_1 and p_2 . Ekim's income is $Y = 1000$.

2.3.1 (N) Determine Ekim's demand for good 1 at prices $p_1 = 2$ and $p_2 = 10$ and state it rounded to integer numbers.

2.3.2 (N) By how much does Ekim's consumer surplus from good 1 increase if the price of good 1 drops to $\hat{p}_1 = 1.5$? State the result rounded to integer numbers. Hint: Do not calculate the consumer surplus for the two prices separately, only the difference of the two. Remember that $\int \frac{1}{x_1} dx_1 = \ln x_1$.

2.3.3(N) By how much does one have to reduce Ekim's income at prices $\hat{p}_1 = 1.5$, $p_2 = 10$ for him to be as well off as at prices $p_1 = 2$, $p_2 = 10$ and income 1000? State the result rounded to integer numbers.

2.3.4 (N) By how much does one have to increase Ekim's income at prices $p_1 = 2$ and $p_2 = 10$ for him to be as well off as under prices $\hat{p}_1 = 1.5$, $p_2 = 10$ and income 1000? State your result rounded to integer numbers.

2.3.5 (N) By how much does one have to increase Ekim's income at prices $p_1 = 2$ and $p_2 = 10$ for him to be just able to afford the bundle that is optimal at $\hat{p}_1 = 1.5$, $p_2 = 10$ and $Y = 1000$? State your result rounded to integer numbers.