Version: A

Examination in Microeconomics A
Summer Term 2008

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 9 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:

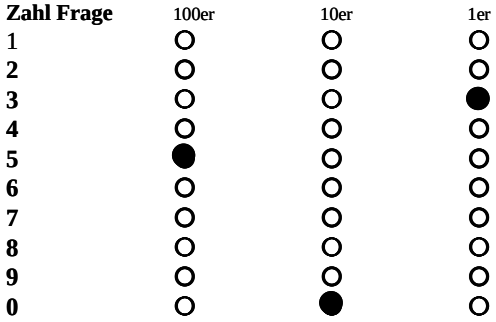

Figure 1:

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 *75 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 repercussions 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, which 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 decision maker has to choose one of the three alternatives $\{A, B, C\}$. In contrast to the lecture, we consider general alternatives here, i.e. the alternatives do not necessarily have to be a subset of $\mathbb{R}^n$ (as in the theory of the consumer). The decision maker has a preference relation concerning the alternatives. Apart from this, the definitions of the lecture apply. Which of the following statements are true?

a If the preferences have the property $B \succ A$, $A \succ C$, $C \succ B$, then they can be represented by a utility function.

b If the preferences have the property $B \succ A$, $A \succ C$, $C \succ B$, then the preference relation is complete.

c A utility function with $u(A) = 5, u(B) = 3, u(C) = 10$ represents the preferences $C \succ A, A \succ B, C \succ B$.

d If an arbitrary $u(.)$ represents the decision maker's preferences, then $v(.)$ also represents the preferences, where

$v(u(A)) = u(A) - 1$

$v(u(B)) = 2u(B)$

$v(u(C)) = u(C)$.

e A utility function that represents the preferences $C \succ A, B \succ A, C \succeq B, B \succeq C$ has to satisfy $u(C) = u(B)$.

1.2. Suppose the preferences of a decision maker can be represented by an expected utility function. Suppose further that there are 2 states of the world, in which the decision maker has state dependent monetary incomes Y_1 and Y_2, respectively. Which of the following statements are true?

a The form of the indifference curves in the (Y_1, Y_2) - diagram in general depends on the probability with which the states are realized.

b If the decision maker is risk-neutral, the indifference curves in the (Y_1, Y_2) - diagram are straight lines.

c Assume that the random variable A has certain income (this means that the state-dependent incomes are on the 45 degree line in the (Y_1, Y_2) - diagram). Statement: A risk-averse decision maker strictly prefers A to any risky random variable with $Y_1 \neq Y_2$ on the same indifference curve.

d A risk-averse decision maker prefers any riskless alternative to a risky state-contingent income.

e If the money utility function is concave then the indifference curves in the (Y_1, Y_2) - diagram are also concave.

1.3. Consider a competitive market for a homogenous good. Which of the following statements are true?

a If the market demand is a strictly decreasing function of the price and the market supply a strictly increasing function of the price, then there exists at least one competitive equilibrium.

b A firm in a competitive market chooses a price and a quantity such that the profit of the firm is maximized.

c In order to optimally plan its supply, a firm requires information about the functional form of the demand curve.

d If there are several market equilibria, then the consumers are indifferent with respect to which of the market equilibria realizes.

e In equilibrium, the consumers are indifferent from which supplier they purchase their goods.

1.4. A consumer may purchase apples and pears. In contrast to what we have assumed in class, apples and pears are not divisible. Let x_A be the amount of apples and x_P be the amount of pears that the consumer wants to consume. The consumer's preferences are as follows. He weakly prefers the bundle $x' = (x'_A, x'_P)$ to the bundle $x'' = (x''_A, x''_P)$ if $2x'_A + x'_A x'_P + x'_P \geq 2x''_A + x''_A x''_P + x''_P$. The consumer is endowed with an income $Y = 10$ and the prices are $p_A = 3$ for apples and $p_P = 5$ for pears. Which of the following statements are true?

a The optimal bundle is $(x_A, x_P) = (3, 0)$.

b In the optimum the consumer spends his entire income.

c In the optimum it must be that |marginal rate of substitution| = |slope of the budget line|.

d The price of apples increases to $p_A^{neu} = 3.1$. Statement: The substitution effect with respect to the consumption of apples is equal to -1.

e The price of apples is now $p_A = 3$ again. Statement: If the consumer's income is reduced by one unit, then the consumer is strictly worse off.

1.5 Consider a market for one single good, where consumers and producers interact competitively. Producers have convex cost functions and consumers convex quasi-linear preferences. Which of the following statements are true?

a Any competitive equilibrium allocation maximizes the consumer surplus.

b If an allocation maximizes the sum of consumer and producer surplus, then there is no other allocation that makes one consumer strictly better off and nobody else worse off.

c For each quantity Q, the area under the market supply curve between 0 and Q is equal to the total cost of all firms in the market.

d If p is not an equilibrium price then there is a price $p' < p$ and one producer and one consumer such that the producer strictly prefers to sell one extra unit at price p' and the consumer to buy this unit at p' (compared to the allocation resulting from p).

e If p is a price such that market demand equals market supply, then the marginal costs of producing these quantities are equal for all firms.

2 Text Problems

2.1 Assume that the typical utility function of a hairdresser is $U(C, F) = \sqrt{C} + 2\sqrt{F}$, 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 for hairdressers. The typical monthly total time budget of a hairdresser is T=450 hours, which individuals can freely allocate to leisure and work.

2.1.1 (MC) This question refers to the usual $C - F$ coordinate system with F on the vertical axis. Exactly one of the following answers is correct.

a If $w = 15$, the hairdresser's budget line intersects the F-axis at $F = 30$.

b The hairdresser's indifference curves intersect the C-axis at a positive angle (i.e. with slope different from 0).

c If the wage rate w increases, the budget line becomes flatter and shifts downwards.

d The hairdresser's marginal rate of substitution between leisure and consumption (dF/dC) increases if F and C increase by the same factor (i.e. from (C, F) to (tC, tF) with $t > 1$).

e None of the above answers is correct.

2.1.2 (N) Assume that in X-Stadt there are 20 trained hairdressers. If the wage is $w = 2$, what is the elasticity of the aggregate supply of hairdressers' labor? State the answer rounded to integer numbers.

2.1.3 (N) The demand for labor in the market for hairdressers in X-Stadt is given by $L^D(w) = 9000/(w + 4)$. In equilibrium, how many hours do the hairdressers in X-Stadt work per capita? State the answer rounded to integer numbers.

2.1.4 (N) Because of the desperate situation in X-Stadt, 10 hairdressers leave the town. What is the number of hours worked per capita by the remaining hairdressers in equilibrium? State the value rounded to integer numbers.

2.1.5 (N) Because the situation of the remaining 10 hairdressers is still unsatisfactory, the town council imposes a minimum wage of $w = 5$. What is the new monthly income of each hairdresser in this new situation? State the answer rounded to integer numbers.

2.2 Peer currently earns $Y_0 = 120$ and knows that he will do so until retirement. He will earn $Y_1 = 100$ when he retires. He wants to maximize his utility from consumption over both periods of his life. His utility function over consumption streams (c_0, c_1) in the two periods of his life is

$$U(c_0, c_1) = \ln c_0 + 0.9 \ln c_1$$

where "ln" denotes the natural logarithm. Between the two periods, Peer can save at the interest rate r_s and borrow at the rate $r_b \geq r_s \geq 0$. (Interpretation: if 1 unit is saved/borrowed at date 0 this yields/costs $1 + r$ at date 1).

2.2.1 (N) Assume that $r_s = r_b = 0.22$. How much will Peer save? State the amount rounded to integer numbers.

2.2.2 (MC) Now assume that the interest rate $r_s = r_b$ falls from its previous level by more than 5 percentage points. Exactly one of the following statements is correct.

a Peer will continue to save but less than before.

b Peer will continue to save and saves more than before.

c Peer will now borrow.

d The question whether Peer will now borrow or save is ambiguous, its answer depends on how much the interest rate falls.

e None of the above four answers is correct.

2.2.3 (N) A pension reform increases Y_1, so that Peer can now expect to have $Y_1 = 110$. What is the smallest interest rate (in percent) at which Peer will still save? (note: "in percent" means that a value of, say, $r = 0.12$ should be marked as 12 on the solution sheet). State it rounded to an integer number.

2.2.4 (N) Now assume that $Y_0 = Y_1 = 100$, and assume further that $r_b = 0.15$ and $r_s = 0.08$. What is Peer's optimal consumption in period 0? State it rounded to integer numbers.

2.2.5 (N) Now assume that Peer's income in both periods increases by 30 percent compared to part 2.2.4. Interest rates are as in question 2.2.4. How much will he save in this new situation? State it rounded to integer numbers.

2.3 The market for Schokowuppies has the following supply function:

$$S(p) = p$$

The inverse demand of a single representative consumer i in the relevant region is

$$p = \frac{Y^2}{q_i},$$

where $Y = 1$ is the consumer's income and q_i denotes the quantity she would like to consume. There are 100 identical consumers in this market, the market is competitive.

In the following calculations, make sure that intermediate results are accurate to 4 decimal places.

2.3.1 (N) Determine the equilibrium quantity of Schokowuppies and state it rounded to integer numbers.

2.3.2 (N) Determine the producer surplus in equilibrium and state it rounded to integer numbers.

2.3.3 (N) The government introduces a value tax (ad valorem tax) of 23% on Schokowuppies that is assessed on the producers. Note the difference to the lecture, where we mainly analyzed quantity taxes. Determine the equilibrium quantity under the value tax and state it rounded to integer numbers.

2.3.4 (N) Determine the government's tax revenues if it levies the value tax of 23% on the producers of Schokowuppies and state it rounded to integer numbers.

2.3.5 (N) Determine the government's tax revenues if it levies a quantity tax of 0.23 instead of the value tax of the previous part and state it rounded to integer numbers.