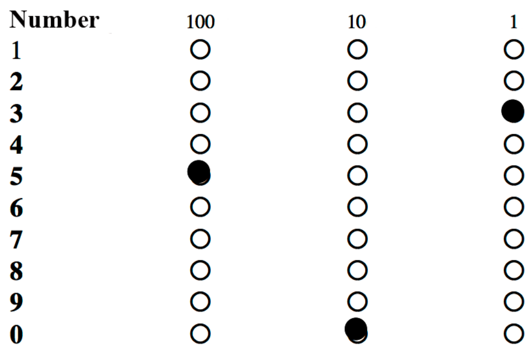
Version: A

Examination in Microeconomics A
Spring Term 2014 (2nd Exam)

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 4 True/False problems and 3 Text Problems.
- For each **True/False Problem** and each of the 5 numerated statements that are made in the problem, you have to decide whether the statement is true (T) or false (F). Please mark T on the solution sheet if the statement is true for all the cases captured by the statement, and mark F for false otherwise. You will be awarded points according to the following rule: If your answer is correct, you obtain *1 point* per statement, and *0 points* otherwise. For each True/False Problem you can therefore obtain up to *5 points*. A priori, any subset of the 5 statements can be true.
- Each **Text Problem** has, on the one hand, a subproblem (MC) consisting of 5 statements denoted by a to e, each of which can be true (T) or false (F). Please mark T on the solution sheet if the statement is true for all the cases captured by the statement, and mark F for false otherwise. Points are awarded according to the same rule as for the True-/False problems described above. A priori, any subset of the 5 statements can be true.

  On the other hand, there are numerical subproblems (N), where you have to fill in the result on the solution sheet in encoded form. For each numerical subproblem you get *2 points* if answered correctly and *0 points* otherwise. For each Text Problem you can therefore obtain up to *13 points*. Here is an example on how to encode integers in the numerical subproblem: Suppose the solution to the question is **503**. Then this number has to be filled in as in the following figure:



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.

- In total you can obtain up to *59 points*.

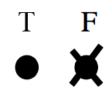
- You will pass the exam with certainty if you obtain at least *29 points* or if you are among the 75% best participants of the exam.

Handling of the solution sheet

- You **only** have to hand in 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! In the case that a circle was already filled in, but then you want to give no answer, first fill in another circle and then cross out both circles (see example). Please use dark colors (black or blue) and no pencil.

- Example: The answer is supposed to be T, answer F was filled in. Then in the end the solution sheet has to look like this:



- You must **sign** your **solution sheet** at the bottom.

Concerning the content of the exam

- If necessary, state your result rounded to the nearest integer.

Good Luck!

1 True-/ False questions

1.1 Suppose that Lisa's preferences over the elements of a set $X \subseteq \mathbf{R}_+^2$ can be described by a complete relation $\succeq$.

1. If X is finite then there is a utility function $u : X \to \mathbf{R}$ which represents Lisa's preferences.

2. If X is finite and $\succeq$ is transitive then there is a utility function $u : X \to \mathbf{R}$ which represents Lisa's preferences.

3. If there is a utility function $u : X \to \mathbf{R}$ which represents Lisa's preferences then $\succeq$ is transitive.

4. If $(3, 3) \succeq (1, 1)$, then $\succeq$ is a monotonic preference relation.

5. If $(9, 5) \succeq (1, 1)$ and $\succeq$ is convex then $(5, 3) \succeq (1, 1)$.

1.2 Let X denote the set of bundles of two goods, each of which can be consumed in arbitrary non-negative quantities (i.e. sets of $\mathbf{R}_+$). Suppose that Lisa's preferences over X are convex, monotonic and all of her indifference curves can be represented by differentiable functions. The prices of goods 1 and 2 are $p_1 = 5$ and $p_2 = 1$, respectively. Lisa has a budget of $m > 0$ to spend on goods 1 and 2. All numerated statements in this problem refer to an arbitrary consumption bundle (x_1^*, x_2^*) that is optimal for Lisa. Denote by $|MRS_{1,2}(x_1^*, x_2^*)|$ the absolute value of the marginal rate of substitution of good 2 for good 1 at the point (x_1^*, x_2^*).

1. If $|MRS_{1,2}(x_1^*, x_2^*)| = 5$ then $x_1^* > 0$ and $x_2^* > 0$.

2. If $|MRS_{1,2}(x_1^*, x_2^*)| > 5$ then $x_1^* > 0$ and $x_2^* = 0$.

3. If $|MRS_{1,2}(x_1^*, x_2^*)| > 5$ then $x_1^* = 0$ and $x_2^* > 0$.

4. If $x_1^* > 0$ and $x_2^* > 0$, then $|MRS_{1,2}(x_1^*, x_2^*)| = 1/5$.

5. If $x_1^* > 0$ and $x_2^* > 0$, then $|MRS_{1,2}(x_1^*, x_2^*)| = 5$.

1.3 Consider a firm with a two-inputs production function f, where both inputs can be chosen in arbitrary non-negative quantities (i.e. sets of $\mathbf{R}_+$) in the long-run. Let $\hat{x}_2 > 0$ be a fixed number. Assume that $f(x_1, x_2) > 0$ if $x_1 > 0$ and $x_2 > \hat{x}_2$, and $f(x_1, x_2) = 0$ otherwise. Moreover, f is strictly increasing in the area in which $f(x_1, x_2) > 0$. Suppose that x_1 can be varied in the short-run while x_2 can only be varied in the long-run and its current level is fixed at $\bar{x}_2 > \hat{x}_2$. The unit price of input i is $p_i > 0$ for $i = 1, 2$. Suppose that the marginal product of input 1 is strictly decreasing for all x_1 if $x_2 = \bar{x}_2$.

1. The costs of the short-run production decision include setup costs equal to $p_2\bar{x}_2$.

2. The short-run cost function includes fixed costs equal to $p_2\bar{x}_2$.

3. The short-run marginal cost function ($SRMC$) is strictly increasing.

4. The long-run cost function includes setup costs equal to $p_2\bar{x}_2$.

5. The long-run cost function includes setup costs equal to $p_2\hat{x}_2$.

1.4 Lisa owns $Y_0 > 0$ euro at the beginning of the current year. She can borrow or lend money only at the beginning of the current year at a yearly interest rate of $r > 0$. She will receive an income of $Y_1 = Y_0(1+r)$ euro at the beginning of the next year. Her utility from an arbitrary consumption path (c_0, c_1) is $u(c_0, c_1) = c_0^\alpha c_1^\beta$, where $\alpha > 0$ and $\beta > 0$ are given parameters. Lisa chooses a utility-maximizing consumption path.

1. Lisa is a borrower if and only if $\alpha > \beta$.

2. Lisa is a borrower if and only if $\alpha < \beta$.

3. If $\alpha = \beta$ then Lisa spends exactly Y_0 euro on consumption in the current year.

4. The higher the interest rate r, the more Lisa consumes in the current year.

5. Suppose that Lisa has, in the current year, consumed the amount she had planned, and then it turns out that the interest rate is actually different from what she had assumed in her plan. Is it possible that Lisa becomes insolvent at the beginning of the next year?

2 Text problems

2.1 Suppose you have an initial wealth that is worth $W = 84$ to you. This wealth includes a car that is worth L to you such that $0 < L < W$. You anticipate that, with probability π (with $0 < \pi < 1$), the car will be stolen, hence your wealth in this case is worth $W - L$ for you. However, you can buy K units of insurance, where you can choose any amount K with $0 \le K \le W$. Buying K units of insurance means that you have to pay the amount gK to the insurance company, and in case your car is stolen you receive K from the insurance company. Here, g ($0 < g < 1$) is a given parameter. You are an expected-utility maximizer with a Bernoulli utility function given by $U(Y) = ln(Y)$ for all money amounts $Y > 0$.

2.1.1 (N) Determine your choice of K if $g = \pi$ and $L = 5$.

2.1.2 (N) Determine L under the assumption that the insurance premium you pay is $gK = 7$, g is actuarially fair, and $\pi = 0.5$.

2.1.3 (N) Determine the expected profit the insurance company makes with your contract if g is actuarially fair.

2.1.4 (N) Determine the expected profit the insurance company makes with your contract if $g = 2/3$, $\pi = 1/3$, and $L = (7/8)W$.

2.1.5 (MC) Which of the following statements is/are true/false?

a. Buying full insurance means to choose $K = L$.

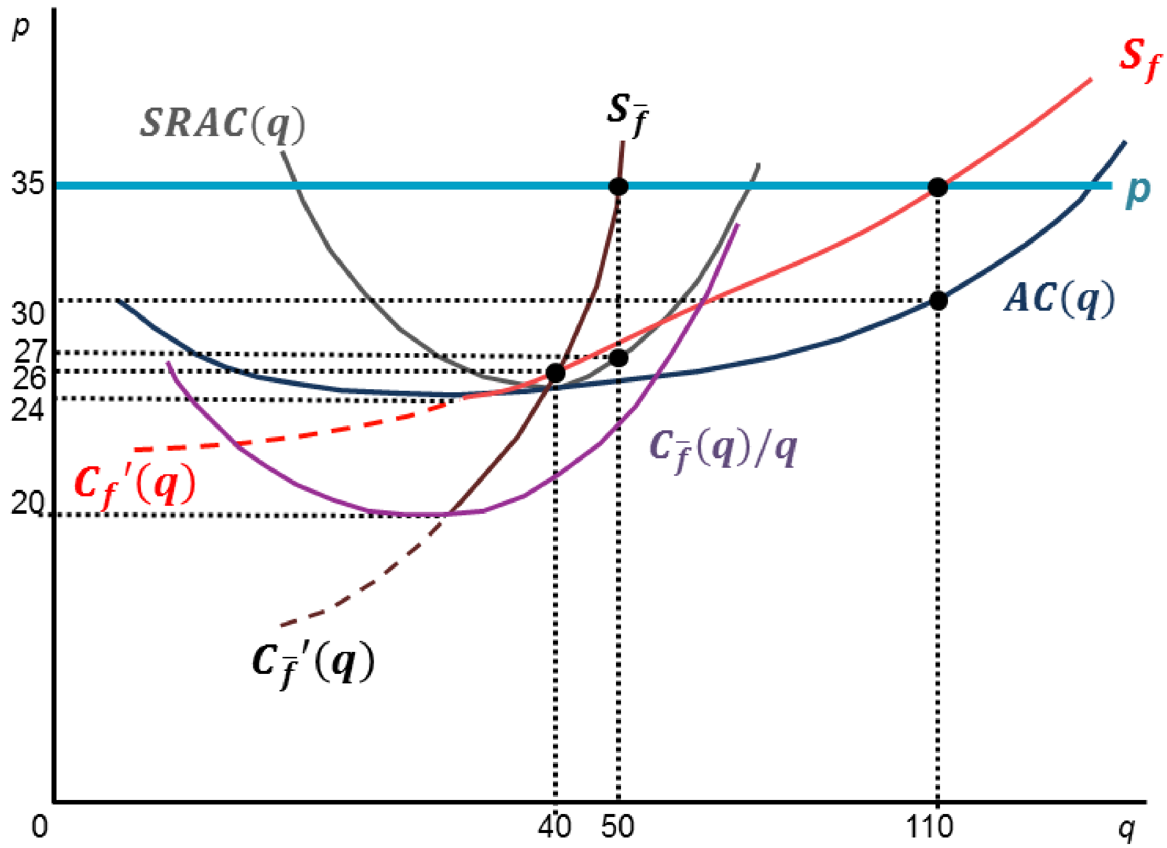
b. You will buy full insurance if $g < \pi$.

c. You are risk-loving.

d. You are strictly risk-averse.

e. If $g > \pi$ and $K \ge 0$, then the expected profit of the insurance company is strictly positive.

2.2 Consider a firm with a two-inputs production function f, where both inputs can be chosen in arbitrary non-negative quantities (i.e. sets of $\mathbf{R}_+$) in the long-run. Suppose that x_1 can be varied in the short-run while x_2 can only be varied in the long-run and its current level is fixed at $\bar{x}_2$. Denote the short-run production function by $\bar{f}(x_1) = f(x_1, \bar{x}_2)$. Suppose that $\bar{x}_2$ is optimal in the long-run if the output price is p_{old}. The firm's short-run supply function is denoted by $S_{\bar{f}}$. The firm's long-run supply function is denoted by S_f. The short-run average-cost function is denoted $SRAC(q)$, and the long run average cost function is denoted $AC(q)$. The average cost of the firm's short-run decision is denoted by $C_{\bar{f}}(q)/q$. The doted functions together with the corresponding supply functions are the short-run and long-run marginal cost functions and are denoted by $C'_{\bar{f}}(q), C'_f(q)$, respectively. To solve the problems below, use the diagram.



2.2.1 (N) Determine the value of p_{old}.

2.2.2 (N) Assume that the output price changes to 35. Determine the firm's profit if it keeps using input 2 at the level $\bar{x}_2$, but adapts the level of input 1 optimally.

2.2.3 (N) Assume that the output price changes to 35 and the firm expects the price to remain at this level. Determine the firm's profit once it has optimally adapted the level of both inputs to the output price 35.

2.2.4 (N) Assume that the output price changes to 35. Determine the firm's output quantity if it keeps using input 2 at the level $\bar{x}_2$ and adapts the level of input 1 optimally.

2.2.5 (MC) Which of the following statements is/are true/false?

a. Assuming that the output price changes to 35 and that the firm expects the price to remain at this level, the increase of the output quantity in the long-run will be larger than in the short-run.

b. If the output price is 22, then the firm exits the market in the long-run.

c. If the output price is 22, then the firm's profit from the short-run decision is negative.

d. If the output price is 22, then the firm shuts down in the short-run.

e. If the output price is 19, then the firm exits the market in the long-run.

2.3 Consider an exchange economy with two goods, 1 and 2, that may be consumed in arbitrary non-negative quantities (i.e. sets of $\mathbf{R}_+$). There are 2 equally large groups of consumers that we call type A consumers and type B consumers. Each consumer in each group is a price-taker. The preferences of each type-A consumer are represented by the utility function $u^A(x_1^A, x_2^A) = \min\{x_1^A, x_2^A\}$, where x_i^A denotes the quantity of good i she consumes. All type-A consumers have the same initial endowment: $e^A = (e_1^A, e_2^A)$ with $e_1^A > 0$ and $e_2^A > 0$. The preferences of each type-B consumer are represented by the utility function $u^B(x_1^B, x_2^B) = 8x_1^B + 4x_2^B$, where x_i^B denotes the quantity of good i she consumes. All type-B consumers have the same initial endowment: $e^B = (e_1^B, e_2^B)$ with $e_1^B > 0$ and $e_2^B > 0$. A competitive equilibrium is described by the prices p_1^*, p_2^* of good 1 and good 2, respectively, the bundle consumed by each type-A consumer, (x_1^{A*}, x_2^{A*}), and the bundle consumed by each type-B consumer, (x_1^{B*}, x_2^{B*}). For problems 2.3.1 to 2.3.4, assume that $e^A = (6, 3)$ and $e^B = (6, 5)$.

2.3.1 (N) Calculate x_1^{A*}.

2.3.2 (N) Calculate x_1^{B*}.

2.3.3 (N) Determine p_2^* if $p_1^* = 2$.

2.3.4 (N) Determine p_1^* if $p_2^* = 4$.

2.3.5 (MC) Which of the following statements is/are true/false?

a. In any competitive equilibrium, $p_1^*/p_2^* = 2$.

b. If $e_1^A \neq e_2^A$ and $e_1^A + e_1^B = e_2^A + e_2^B$, then in the competitive equilibrium type A is always strictly better off than with her initial endowment, while type B is always indifferent between her initial endowment and the competitive outcome.

c. If $e_1^A + e_1^B < e_2^A + e_2^B$ then there exists a Pareto efficient point in which type-B consumers consume nothing of good 1.

d. Every point on the contract curve is Pareto efficient.

e. There exist initial endowments such that there are infinitely many competitive equilibria in which $p_1^* = 1$.