Microeconomics
Fall 2024-2025
Resit exam
January 2025

Duration: 3 hours (180 minutes)

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General Guidelines

- You may use a calculator;
- You may **not** use a programmable calculator;
- You may **not** use notes or books;
- You may have some food and beverages on your desk;
- All other belongings, including phones, must be on the floor;
- You can only leave the room after 30 minutes into the exam and up unto 15 minutes before the exam ends;
- Write all your answers on the blank answer sheets brought by you;
- Write your name and student number on every answer sheet;
- Number all your answer sheets and hand them in in chronological order;
- If a question does not ask for an explanation, there is no need to give one;
- This exam is to be handed in together with your answer sheets;
- Any form of fraud will, at least, imply an invalid grade for this course.

1. Production (3 points)

Let $y = \beta x_1 + \gamma x_2 + x_2$ be a production function, where y is the output and x_1 and x_2 are the two inputs.

1.1. Find the Technical Rate of Substitution (TRS) for the production above.

Consider for the following two questions that $\beta = 1$ and $\gamma = 2$.

1.2. Carefully sketch the input requirement set for producing at least 12 units of output:

$$\{ (x_1, x_2) \;\; in \; R_+^2 \;\mid\; 1x_1 + 2x_2 + x_2 \geq 12 \}$$

1.3. Consider that in the short run x_1 is fixed at a value of 3. Carefully sketch the short-run production possibilities set:

$$\{ (y, x_2) \;\; in \; R_+^2 \;\mid 1x_1 + 2x_2 + x_2 \geq y, x_1 = 3 \}$$

2. Profit and costs (4 points)

2.1. Provide the formula for the Weak Axiom of Cost Minimization (WACM) and briefly describe the data needed to test it.

2.2. Briefly explain the Envelope theorem. You may use words and/or equations.

2.3. Consider a firm that uses two inputs x_1 and x_2 to produce output y via the following production function: $y = \min\,(x_1, x_2)$. Explain in words, or graphically, *if* and *how* changes in the input prices w_1 and w_2 change the conditional factor demands for x_1 and x_2.

2.4. Now consider a firm that uses two inputs x_1 and x_2 to produce output y via the following production function: $y = x_1 + x_2$. Explain in words, or graphically, *if* and *how* changes in the input prices w_1 and w_2 change the conditional factor demands for x_1 and x_2.

3. Consumer choice (5 points)

Consider a consumer with a utility function equal to $u = x_1^{\alpha} x_2^{\beta}$. The consumer has income m, and the price for good x_1 and x_2 are denoted by p_1 and p_2 respectively.

3.1. Find the Marshallian demand functions for both good 1 and 2.

3.2. Take the derivative of the Marshallian demand functions derived in question 3.1 towards m. Use these derivatives to discuss under which restrictions on α and β the Marshallian demand functions for good 1 and 2 are less steep (with price on the vertical axis and quantity on the horizontal axis) than the Hicksian demand functions for good 1 and 2 respectively.

Consider for the following three questions that $u = x_1^{0.5} x_2^{0.5}$.

3.3. Briefly explain what the Marginal Rate of Substitution (MRS) is. Find the MRS for the utility function above.

3.4. The consumer wants to reach a certain utility level $\bar{u}$. Find the expenditure function as a function of $\bar{u}$, p_1, and p_2. Briefly discuss what the expenditure function represents.

3.5. To find the Lagrange multiplier lambda one can take the derivative of the expenditure function towards an exogenous variable. Which exogenous variable is this? Find lambda via this route. Provide a brief economic interpretation for lambda while assuming that $p_1 = p_2 = 1$ and $\bar{u} = 5$.

4. Welfare (4 points)

Consider a consumer with a utility function equal to $u = 2\sqrt{x_1} + x_2$. The consumer has income $m = 10$, and the price for good x_1 and x_2 are $p_1 = 1$ and $p_2 = 2$ respectively.

4.1. Carefully sketch three indifference curves with varying levels of utility for the utility function above. Briefly explain the special feature of these indifference curves. Also briefly explain what this special feature implies for the income effect.

4.2. Consider that p_1 changes from 1 to 2. Find the compensating variation for this change in the price for good 1.

4.3. Explain why for this utility function the compensating variation is equal to the change in consumer surplus.

5. Perfect competition (2 points)

Consider a perfect competitive market. Let the total cost function of *a single* firm be equal to

$$c(y) = 0.5y^2 + 8$$

Let the *market* demand be given by

$$X(p) = 60 - 5p$$

And suppose that in the long run there is free entry into and exit out of this market, where all potential firms have the same cost function $c(y)$ as above.

5.1. How many firms will there be active in this perfect competitive market in the long run?

6. Monopoly (2 points)

6.1. Briefly explain why the marginal revenue is always positive in a perfectly competitive market, while it can be negative for a monopolist.

6.2. A monopolist's elasticity of demand is -3 and its marginal costs are equal to 10. Calculate the mark-up. Briefly explain why the mark-up may be used as a measure of market power.