Microeconomics
Fall 2025-2026
Regular exam
December 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 to 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;
- Any form of fraud will, at least, imply an invalid grade for this course.

1. Production (3 points)

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

1.1. What type of returns to scale does the production function have?

Consider for the following two questions that $\beta = 3$ and $\gamma = 3$. In your answers, make sure to label everything you graph, such as the axes, intercepts, slope, and others.

1.2. Carefully sketch the isoquant and input requirement set for producing at least 6 units of output:

$$\{\, (x_1, x_2)\ \ in\ R_+^2\ \mid 3x_1 + 3x_2 \geq 6 \,\}$$

1.3. Consider that in the short run x_2 is fixed at a value of 3. Carefully sketch the short-run production possibilities set:

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

2. Profit and costs (4 points)

Consider a firm producing one output using one input. The firm has a production function $y = f(x)$. The price is fixed at p and the cost of input x is fixed at w. The firm wants to maximize its profits $\pi = pf(x) - wx$.

2.1. Graphically represent the profit maximization problem of the firm. Make sure to label the axes, intercepts and slope. Then, state the second-order condition (SOC) for profit maximization. Using a graph, briefly show why the SOC is needed for maximization.

2.2. Consider now that the production function is: $f(x) = x^{\alpha}$. Show that the second-order condition requires that $\alpha \leq 1$.

For the following two questions, consider that the firm is now producing one output y using two inputs, x_1 and x_2. The production function is $f(\boldsymbol{x}) = x_1^{\alpha} x_2^{1-\alpha}$, where factor x_2 is fixed at k in the short-run.

2.3. Now, consider the same firm is cost minimizing. Find the short-run conditional factor demand function $x_1(\boldsymbol{w}, y, x_2 = k)$.

2.4. Find the short-run cost function $c(\boldsymbol{w}, y, x_2 = k)$, as well as the short-run average variable cost, the short-run average fixed cost and the short-run marginal cost.

[The exam continues on the following page.]

3. Consumer choice (5 points)

Consider that the consumer has a utility function equal to $u = x_1^{\alpha} x_2^{1-\alpha}$. The consumer has income m, and the price of goods x_1 and x_2 are p_1 and p_2, respectively.

3.1. Find the Marshallian demand function for good 1, x_1. (Hint: you may use logs, but if you do, you need to explain why this is possible.)

3.2. Find the Hicksian demand function for good 1, h_1.

3.3. State and briefly explain in words the duality between the utility maximization problem and the expenditure minimization problem. You may also use equations and/or graphs.

3.4. Using the Slutsky equation, briefly discuss the relationship between Marshallian and Hicksian demands for good x_1. Briefly explain when the Marshallian and Hicksian demands coincide.

3.5. What type of good is x_1? Briefly justify and make any assumption if necessary.

4. Welfare (4 points)

Consider a consumer with a utility function equal to $u = 4\sqrt{x_1} + x_2$. The consumer has income $m = 10$, and the prices of goods x_1 and x_2 are p_1 and p_2 respectively (with $p_1 > 0, p_2 > 0$).

4.1. Find both the Marshallian and the Hicksian demand function for good x_1. Consider only interior solutions.

4.2. What can you say about the relationship between the Marshallian and Hicksian demand you just derived? Explain and discuss the implications for the three measures of welfare.

4.3. Consider that $p_2 = 4$. Find the compensating variation for a change in p_1 from 1 to 2. (some values may not be integers and can be left as a fraction)

5. Perfect competition (2 points)

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

$$c(y) = 0.5y^2 + 12.5,$$

where *y* is the output. Let the *market* demand be given by:

$$X(p) = 100 - 2p,$$

where *p* is the price. Suppose that in the long run there is free entry into and exit from the market, and that all potential firms have the same cost function $c(y)$ as above.

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

[The exam continues on the following page.]

6. Monopoly (2 points)

Consider a monopoly with the following demand function and total cost function:

$$Q(p) = 45 - 3p$$
$$c(Q) = 45 + 10Q + Q^2$$

Where Q is the quantity and p is the price.

6.1. What is the monopolist's profit-maximizing level of production? (the solution will not be an integer and can be left as a fraction)

6.2. Will a monopolist ever choose to produce a quantity where the elasticity of demand ϵ satisfies $-1 < \epsilon < 0$? Is demand elastic or inelastic in that region? Explain the economic intuition for this behavior of a monopolist. You can use formulas and/or graphs to support your explanation.