

Name:	Roll Number:

Endterm (Set A)
SIAS, Krea University (AY 2025-26)
Mathematical Methods for Economics (Course Code: ECON211)
25 September 2025

Maximum Points: 30

Duration: 100 minutes

Instructions and Advice:

- This is a closed book exam.
- This exam accounts for 30% of your grades.
- You need to answer 14 questions in all.
 - The first section contains 8 questions, each carrying 1 point.
 - The second section contains 4 questions, each carrying 3 points.
 - The third section contains 2 questions, each carrying 5 points.
- All questions are compulsory. Points for each question are mentioned in parentheses.
- At no point during the exam, you are allowed to ask clarificatory questions. Make reasonable assumptions if you have doubts and proceed to answer the question.
- You are not permitted to use any electronic device including calculators.
- There is plenty of time. Use it wisely, do not rush.
- Show all your work. Answers that skip steps will receive penalty.
- Please highlight your main answer(s).
- All the best!

Short Answer Questions-I

1. (1 point) Is $\lim_{x \rightarrow 0} |x - 2| = \lim_{x \rightarrow 0} |x| - 2$? Explain briefly.
2. (1 point) Let $f(x) = \frac{6}{2+x}$. Find $f^{-1}(x)$.
3. (1 point) Let $f(x) = x^{x-1}$. Find $f'(x)$.
4. (1 point) Determine if the function $f(x) = x^2 - 4x + 3$ is increasing or decreasing in $[1, 3]$.
5. (1 point) Let $x^2y^3 + x^3y^2 = 5$. Find $\frac{dy}{dx}$.
6. (1 point) Let $f(x) = \sqrt{x} + 3$ and $g(x) = f^{-1}(x)$. Find $g'(5)$.
7. (1 point) Suppose that f and g are continuous on $[0, 4]$ and that $\int_0^4 (f(x) - g(x))dx = 2$ and $\int_0^4 (3f(x) - 4g(x))dx = 4$. Find $\int_0^4 (f(x) + g(x))dx$.
8. (1 point) Compute: $\int (3x^2 + \frac{2}{x} + e^{3x})dx$

Short Answer Questions-II

9. (3 points) Given the demand function for comedy shows on *Ruinmyshow*: $p = \frac{16}{q+3} - 3$,
 - (a) ($\frac{1}{2}$ points) Compute the total revenue.
 - (b) ($\frac{1}{2}$ points) Compute the marginal revenue.
 - (c) (2 points) Compute the revenue-maximizing price and quantity.
10. (2+1 points) The total cost of producing *Phantom cigarettes* is $C(q) = 2q^2 + 10q + 32$. Find the value of q which minimizes the average cost. Show that the marginal cost is equal to the average cost at this point (where the average cost is being minimized).
11. (3 points) Let $f(x, y) = 6x^{1/3}y^{2/3}$.
 - (a) (1 point) Determine the degree of homogeneity.
 - (b) (2 points) Compute all first and second order partial derivatives.
12. (1+1+1 points) Let $U = 2\sqrt{x} + y$. Compute the marginal utilities and the marginal rate of substitution.

Long Answer Questions

13. (5 points) Consider $f(x, y) = \frac{x^3}{3} + \frac{y^3}{3} + x^2 + \frac{y^2}{2} - 3x - 6y + 5$. Find and classify all stationary points.
14. (5 points) The demand for robots in *Tatooine* is given by $p = 20 - 2q$ and the supply of robots is given by $p = 4 + 2q$.
 - (a) (1 point) Compute the equilibrium price and quantity.
 - (b) (1+1 points) Compute the consumer surplus and producer surplus.
 - (c) (1+1 points) Now, suppose that the Damiyo (the ruler of Tatooine), sensing that the robots are valuable, announces a price floor of 14. Compute the new consumer surplus and producer surplus.