Name:	Roll Number:

Endterm (Set B)

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) Let $f(x) = x^{x-2}$. Find $f'(x)$.
2. (1 point) Determine if the function $f(x) = x^2 - 8x + 15$ is increasing or decreasing in $[3, 5]$.
3. (1 point) Let $x^2y^3 + x^3y^2 = 7$. Find $\dfrac{dy}{dx}$.
4. (1 point) Let $f(x) = \sqrt{x} + 5$ and $g(x) = f^{-1}(x)$. Find $g'(7)$.
5. (1 point) Suppose that f and g are continuous on $[0, 4]$ and that $\int_0^4 (f(x) - g(x))dx = 4$ and $\int_0^4 (3f(x) - 4g(x))dx = 11$. Find $\int_0^4 (f(x) + g(x))dx$.
6. (1 point) Compute: $\int (6x^2 + \dfrac{3}{x} + e^{4x})dx$
7. (1 point) Is $\lim\limits_{x\to 0} |x - 3| = \lim\limits_{x\to 0} |x| - 3$? Explain briefly.
8. (1 point) Let $f(x) = \dfrac{9}{3 + x}$. Find $f^{-1}(x)$.

Short Answer Questions-II

9. (3 points) $f(x, y) = 6x^{2/3}y^{1/3}$
   (a) (1 point) Determine the degree of homogeneity.
   (b) (2 points) Compute all first and second order partial derivatives.
10. (1+1+1 points) Let $U = x + 2\sqrt{y}$. Compute the marginal utilities and the marginal rate of substitution.
11. (3 points) Given the demand function for comedy shows on *Ruinmyshow*: $p = \dfrac{25}{q + 4} - 4$,
    (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.
12. (2+1 points) The total cost of producing *Phantom cigarettes* is $C(q) = 2q^2 + 10q + 50$. 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).

Long Answer Questions

13. (5 points) The demand for robots in *Tatooine* is given by $p = 18 - 2q$ and the supply of robots is given by $p = 2 + 2q$.
    (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 12. Compute the new consumer surplus and producer surplus.
14. (5 points) Consider $f(x, y) = \dfrac{x^3}{3} + \dfrac{y^3}{3} + x^2 + \dfrac{y^2}{2} - 3x - 6y + 3$. Find and classify all stationary points.