



Australian
National
University

Venue _____

Student Number

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Research School of Economics
NOT AN ACTUAL EXAMINATION

Semester 1 — End of Semester, 2024

**EMET7001_Semester 1 Mathematical Techniques for
Economic Analysis**

This paper is for ANU students.

Examination Duration:	45 minutes
Reading Time:	1 minute
Exam Conditions:	N/A
Materials Permitted In The Exam Venue:	No materials permitted (No electronic aids are permitted e.g. laptops, phones)
Materials To Be Supplied To Students:	1 x 20 page
Instructions To Students:	See next page

INSTRUCTIONS TO STUDENTS

- Read the questions carefully.
- Questions are worth different amount of marks given in parenthesis. Sub-questions in each questions are of equal value.
- To maximize your marks, explain all the steps in your arguments.
- If any part of the question seems missing or ambiguous, state clearly the way you interpret it, and carry on with your answer.
- In solving the questions, you can use any fact from the lecture materials without proof, unless specifically asked to give details. In either case, you should clearly state the relevant fact.
- You do not need to do the questions in order, as long as you clearly mark in your answer sheets which question you are addressing.
- Do not forget to put your correct ANU uID number on the front page of the answer book.

QUESTIONS

Question 1. (10 marks)

Given a set $A = \{2, 3, -4, 0, \frac{1}{3}\}$, answer the following subquestions, giving the relevant definitions to all the mentioned terms:

- What is the cardinality of the set A ?
- What is the cardinality of the power set of A ?
- For $n \in \{2, 3, 4\}$ write down the sets B_i defined in the following way:

$$\forall i \in \{1, \dots, n\} B_i \subset A \text{ s.t. } B_i \cap B_j = \emptyset \text{ for } i \neq j, \cup_{i=1}^n B_i = A$$

Question 2. (10 marks)

Sketch a plot of a mapping $f: \mathbb{R} \rightarrow 2^{\mathbb{R}}$ given by the following formula:

$$f(x) = \{y \in \mathbb{R} \text{ s.t. } |y| \leq \sqrt{x+3}\}$$

Question 3. (20 marks)

Solve a linear system by Gaussian elimination:

$$\begin{cases} x_1 + 2x_2 - x_4 = 0 \\ 2x_2 - x_3 + x_4 = 4 \\ x_3 - x_4 = 0 \\ x_1 + 2x_2 - x_3 = 0 \end{cases}$$

Question 4. (30 marks)

Find all values of parameter $a \in \mathbb{R}$ such that the system

$$\begin{cases} (x^2 + y^2 + 6x)\sqrt{x+y+6} = 0 \\ y = a(x-3) \end{cases}$$

has exactly two distinct solutions.

END OF EXAMINATION