الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

Final Exam
PMATH-I.II: Arithmetics II
Spring 2025

Points of attention:

- For each question, the maximum earned points are specified in the question.
- Write clearly! Answers that are not readable are not marked and don't earn marks!
- All answers should be written in English using **blue or black pens** only.
- Use the pencil only for diagrams and graphs.
- Show all the calculation steps in the given space.
- When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

Exam Duration: 2 hours
Instructor's Name: Muhammad Javed
Exam Date: 19/06/2025
Program: LTM

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Student Information			
Name:		ID:	
Signature:			

Invigilator			
Initials:		☐ Student ID checked	
Time received:			

Question 1 **[10 marks]**

Determine the derivative of the following function among the Product, Quotient and chain rules.

a. $F = (x+3)(4x^2+5x)$ (5 marks)

b. $y = \dfrac{1}{(3x^3-2x^2)^{10}}$ (5 marks)

Question 2 **[5 marks]**

Using definition method, determine the derivative

$$f(x) = \sqrt{3x}$$

Question 3 **[5 marks]**

For the following cost function

$$f(x) = 0.4x^2 + 3.2x + 11$$

Where x is the number of units?

a. Determine the relative rate of change of $f(x)$when $x = 15$. (4 marks)

b. Calculate the percentage rate of change of $f(x)$ with respect to $x = 15$ up to 4 decimal places. (1 mark)

Question 4 **[5 marks]**

If $y = 3x - 3x^2 + x^3$ is a cost function, when is the marginal cost increasing?

Question 5 **[5 marks]**

For a manufacturer's product, the revenue function is given by

$$r = 180q + 87q^2 - 2q^3$$

Determine the output for maximum revenue.

Question 6 **[5 marks]**

If the marginal-revenue function for a manufacturer's product

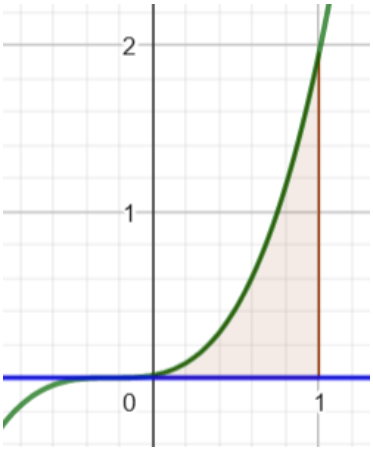
$$\frac{dr}{dq} = 2000 - 20q - 3q^2$$

Determine the demand function.

Question 7 **[5 marks]**

Calculate the shaded area on x-axis, from 0 to 1 ,under the following function

$$f(x) = \left(x + \frac{1}{4}\right)^3, x \geq 0$$



Use definite integration, write the answer to three decimal places. Show all steps of calculation from integral representation to the final answer.

Rules

a. Derivative

1. $\frac{d}{dx}(x^n) = nx^{n-1}$
2. $(f.g)' = f'.g + f.g'$
3. $\left(\frac{f}{g}\right)' = \frac{f'.g - f.g'}{g^2}$

b. Integration

1. $\int x^n\, dx = \frac{x^{n+1}}{n+1} + c$
2. $\int \frac{1}{x} dx = \ln x + c$
3. $\int [f(x)]^n f'(x)\, dx = \frac{[f(x)]^{n+1}}{n+1} + c$

MLO & Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	**3**	Understanding/Application	**10**	
2	**1**	Understanding	**5**	
3	**2**	Understanding /Application	**5**	
4	**4**	Application/Evaluating	**5**	
5	**4**	Evaluating	**5**	
6	**3**	Understanding /Application	**5**	