



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICS AND STATISTICS**

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 07BECO	LEVEL: 5
COURSE CODE: MFE511S	COURSE NAME: MATHEMATICS FOR ECONOMISTS 1A
SESSION: JULY 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY / SECOND OPPORTUNITY QUESTION PAPER	
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INSTRUCTIONS	
<ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil.	

THIS QUESTION PAPER CONSISTS OF 7 PAGES (Including this front page)

QUESTION 1 (1 mark each = 6 marks)

For each of the following statements, indicate whether True (T) or False (F)

- 1.1 The slope of a demand function is always negative
- 1.2 $\log(x + 3) = \frac{1}{2}$ is the same $10^{\frac{1}{2}} = x + 3$
- 1.3 A quadratic expression is a polynomial of degree three
- 1.4 Given $Y = \log 4$, then Y' is impossible
- 1.5 $\int(-6x^{-3})dx = \frac{3}{x^2} + C$
- 1.6 Differentiation is the process of computing the rate of change (gradient at a given point) of a function

QUESTION 2 [17 marks]

(Write down the letter corresponding to the best option for each question in the answer booklet provided)

- 2.1 The expression $-xy + \frac{1}{2}x^2y^2 - \frac{3}{4}y^2x + \frac{3}{2}x^2y^2 + yx$, simplifies to: [2]
- A. $2x^2y^2 - \frac{3}{4}y^2x$ B. $\frac{3}{4}y^2$ C. $x^2y^2 - \frac{3}{4}y^2$ D. None
- 2.2 Which of the following equation is the same as $y = 3\sqrt{x}$ [2]
- A. $y = x^{\frac{1}{2}}$ B. $y = x^{\frac{1}{3}}$ C. $y = 3x^{\frac{1}{2}}$ D. $y = \sqrt{3x}$
- 2.3 The value(s) of x in the equation $ax^2 + bx + c = 0$, represent: [2]
- A. the turning point of the equation
- B. the minimum value of the function
- C. the x -intercepts of $y = ax^2 + bx + c$

D. the x – *coordinates* or the y – *intercept*

2.4 Which of the following statement is not true: [2]

A. A linear function can have a positive or negative slope

B. Logarithm of a number between 0 and 1 is negative

C. $9x^2 - 15x + 4 = 0$, has two same solutions

D. *Revenue = price per item \times number of items*

2.5 The expression, $3 \log_5 3 + 2 \log_5 2 + \frac{1}{2} \log_5 4$ can be simplified into a single log: [2]

A. $\log_3 216$

B. $\log_5 108$

C. $\log_5 27$

D. $\log_5 216$

2.6 If $Y = \ln(3x^{-2} + 7)$, then $\frac{dy}{dx} = ?$ [2]

A. $\frac{-6x^{-3}}{3x^{-2}+7}$

B. $\frac{6x^{-1}}{3x^{-2}+7}$

C. $-6x^{-3}$

D. $6x^{-3}$

2.7 A tractor manufacturing company has the following production for the Massey

$$\text{tractor: } M(K, L) = 90K^{\frac{2}{3}}L^{\frac{1}{3}}$$

Where M is the number of Massey tractors produced with L units of labor and K units of capital. The marginal productivity of capital K is given as: [3]

- A. $\frac{\partial M}{\partial K} = 60K^{\frac{2}{3}}L^{\frac{1}{3}}$
- B. $\frac{\partial M}{\partial K} = 45K^{\frac{2}{3}}L^{-\frac{2}{3}}$
- C. $\frac{\partial M}{\partial K} = 45K^{\frac{2}{3}}L^{\frac{-2}{3}}$
- D. $\frac{\partial M}{\partial K} = 60K^{-\frac{1}{3}}L^{\frac{1}{3}}$

2.8 If the function $f(x)$ is neither increasing nor decreasing at that specific point, say point a , then $f'(x)$ at point a : [2]

- A. must equal to zero or undefined
- B. must equal to one
- C. must equal to a
- D. must be equal to $f''(x)$

QUESTION 3 [57 marks]

3.1 Simplify the following expressions

3.1.1 $35xy - 20xy^2 - 19xy + 19xy^2 - 10xy - 1$ [3]

3.1.2 $\frac{x^2+3x-10}{x^2-4}$ [6]

3.2 Solve the equation $\log_3(x + 3) + \log_3(x - 3) = \log_3 16$ [4]

3.3 A small economy produces tomatoes and the domestic demand and domestic supply functions in this economy are given as:

$$Q_d = -5 + 3p \quad \text{and} \quad Q_s = 10 - 2p$$

Calculate the equilibrium price (p) and equilibrium quantity (Q) for this economy [4]

3.4 Davis Manufacturing estimates that its weekly profit, π , in hundreds of dollars, can be approximated by the formula $\pi = -3q^2 + 6q + 10$, where q is the number of units produced per week, in thousands.

3.4.1 How many units the company should produce per week to earn maximum profit and determine the maximum weekly profit? [5]

3.5 The commodity market for a simple two sector economy is in equilibrium when $Y = C + I$. The money market is in equilibrium when the supply of money (M_s) equals the demand for money (M_d), which in turn is composed of the transaction-precautionary demand for money (M_t) and the speculative demand for money (M_z)

$$M_s = M_d = M_t + M_z$$

Assume a two-sector economy where:

$$C=48+0.8Y, \quad I=98-75i, \quad M_s=250,$$

$$M_t=0.3Y, \quad \text{and} \quad M_z=52-150i$$

3.5.1 Determine the equilibrium Income(Y) and Interest rate(i) [8]

3.5.2 Determine the value of $C, I, M_t,$ and M_z [4]

3.6 Ndeshi has N\$420 to spend on two different goods (L, K) whose respective prices are N\$20 and N\$14 respectively.

3.6.1 Formulate an isocost function that describe the different combination of labor and capital. [2]

3.6.2 Draw an isocost line to show all the different combinations of the two goods that can be bought with the given budget. [3]

3.6.3 What happens to the original isocost line if the budget falls by 10%? [2]

3.7 Consider a Cobb-Douglas production output function given as $Q = AK^{\frac{1}{2}}L^{\frac{3}{4}}$, where Q is the quantity of output in physical units, A is the level of technology, K is the quantity of capital, L is the quantity of labour.

3.7.1 Will this function exhibit a decreasing return to scale or an increasing return to scale, justify your answer. [2]

3.7.2 Show that $Q_1 = 3.948Q$ if the two inputs (L, K) are multiplied by three. [4]

3.8 The total revenue function and the total cost function for a company producing bottles of water are given as:

$$R(x) = 560x - 2x^2 \text{ and } C(x) = 60x + 150$$

3.8.1 What costs will this company incur if no bottles of water are produced [2]

3.8.2 What is the marginal revenue from producing the 50th bottle of water [4]

3.8.3 Derive the profit function for this company [3]

QUESTION 4 [20 marks]

4.1 Find the derivative of each the following function

4.1.1 $y = 3x^3 - \sqrt[3]{x} + e^x + \ln x$ [4]

4.1.2 $F(x) = \frac{3x+5}{x^2-2}$ [4]

4.2 If $x^2 + 2xy + y^3 = 0$, Determine $\frac{dy}{dx}$ at (1,2) [7]

4.3 Evaluate [5]

4.3.1 $\int (6x^2 - \sqrt{x} + \frac{1}{x} + 3) dx$

END OF PAPER

TOTAL MARKS:100