



**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: JUNE 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION 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.

PERMISSIBLE MATERIALS

1. Non-Programmable calculator without the cover

THIS QUESTION PAPER CONSISTS OF 5 PAGES (Including this front page)

QUESTION 1 (1 mark each = 7 marks)

For each of the following statements, indicate whether True or False

1.1 $\sqrt{625} - \sqrt{25} = \sqrt{625 - 25}$

1.2 $\log_2(2x) = \log_2 x - 1$

1.3 $\sqrt{a^{3x}} \times \left(a^{-\frac{x}{4}}\right)^2 = a^x$

1.4 Fixed costs are the costs that does not vary with the unit produced

1.5 Every non-linear function has no slope

1.6 A function describes a relationship between two or more variables

1.7 In a Keynesian consumption function the slope is referred to as MPC

QUESTION 2 [2 marks for each correct question =16]

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

2.1 The quadratic expression $x^2 - 9$ can be factorized as: [2]

- A. $(x - 9)(x - 9)$ B. $(x - 3)(x + 3)$ C. $(x + 3)(x - 9)$ D. None

2.2 The value of x in the equation $\frac{4^{2x}}{8^x} = 32$ is: [2]

- A. 5 B. 2 C. 1 D. 32

2.3 The value of x in the equation $2 \log_7 2 + \log_7 x = \log_7 32$ is: [2]

- A. 7 B. 8 C. 2 D. 32

2.4 Consider the Keynesian Consumption function: $C = 550 + 0.5Y$, where Y is the level of income. This function tells us that when there is no income the total level of consumption N\$ is: [2]

- A. N\$1100 B. N\$550 C. N\$550.50 D. 0

2.5 The function $f(x) = -2x^2 + 4x - 5$ has a maximum turning point and this turning point is:

- A. (-3,1) B. (-1, 3) C. (1, -3) D. (1, 3) [2]

2.6 Mandala has N\$150 to spend on two different goods (labor (L), capital (K)) whose respective prices are N\$10 and N\$7 respectively. The isocost line that show all the different combinations of the two goods that can be bought with the given budget is represented by the equation: [2]

- A. $150 = 7L + 10K$
 B. $150 = 7k + 10L$
 C. $Q = A10k^\alpha 7L^\beta$
 D. $150 = A10k^\alpha 7L^\beta$

2.7 Given the production function $Q = AK^{\frac{1}{5}}L^{\frac{4}{5}}$, 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:

2.7.1 If the level of capital and labour are doubled these will result in _____ production function? [2]

- A. 2% increase B. doubling C. decreasing D. constant

2.7.2 This is an example of _____ return to scale [2]

- A. increasing B. decreasing C. constant D. A&C

QUESTION 3 [39 marks]

3.1 Simplify the following expressions

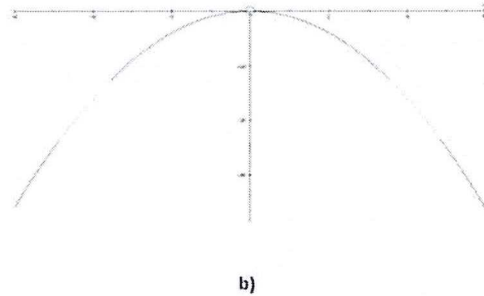
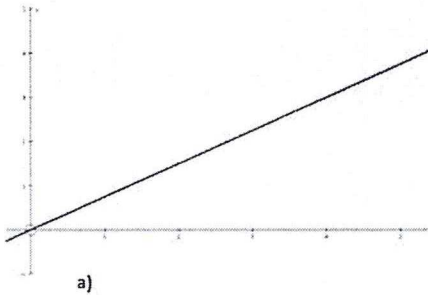
a) $-2a(am - m)^2 - m(2a^2m - 2am - 2a^3m)$ [5]

b) $\left(\frac{(3x^a y^b)^3}{(-3x^a y^b)^2}\right)^2$ [4]

c) $\log_3 81^{-1} + \log_6 36 - \log_2 \sqrt{4^2}$ [5]

3.2 Solve the equation $\log_9 x + \log_9 x^2 + \log_9 x^3 + \log_9 x^4 = 5$ [4]

- 3.3 Determine which of the following graphs is a **function** and which one is **not a graph of a function** [2]



- 3.4 The Income Determination model for a **3-sector** economy is given as

$$Y = C + I + G; C = C_0 + bY, I = I_0, G = 120$$

Where $Y = \text{Income}$, $C = \text{Consumption}$, $I = \text{Investment}$ and $G = \text{Government expenditure}$.

With the above information determine showing all necessary steps

- 3.4.1 The reduced form of Y [5]
- 3.4.2 The numerical value of income, Y given that: [3]

$$C_0 = 220, b = 0.55, I_0 = 110$$

- 3.5 A company operating in a pure competition receives N\$375 for each unit of output x sold. It has a variable cost of N\$150 per item and a fixed cost N\$11250.

- 3.5.1 Formulate the total cost function. [2]
- 3.5.2 Formulate the total revenue function. [2]
- 3.5.3 Formulate the total profit function. [2]
- 3.5.4 What production level will break even? [2]
- 3.5.5 Determine the profit level P if the company sells 2050 items. [2]

- 3.6 A production output function is given as $Q_1 = AK^{0.75}L^{0.5}$, where K is the quantity of capital, L is the quantity of labour and A is the level of technology.

- a) Calculate the new level of production Q_2 if the costs of both capital and labour is doubled. [5]
- b) Determine the cost of production output Q_1 if the cost of technology is N\$17.75, cost of capital is N\$25 and the cost of labour is $\frac{3}{4}$ of the cost of the capital. [3]
- c) Determine the marginal productivity of capital. [3]

QUESTION 4 [38 marks]

4.1 Find the derivative of each the following function

4.1.1 $y = 2x^3 - e^{2x} + \log 4x^2$ [4]

4.1.2 $y - 2x + y^2 + 3 = 0$ [4]

4.1.3 $z = \sqrt{6x - 9}$ [4]

4.2 The sales (in millions of N\$) of DVDs of a hit movie t years from the date of release is given by: $F(t) = \frac{6t}{2t+5}$

4.2.1 Find the rate at which the sales are changing at time t [5]

4.2.2 How fast are the sales changing at the time the DVDs are released ($t = 0$)? [3]

4.2.3 How fast are the sales changing two years from the date of release ($t = 2$)? [3]

4.3 Given the profit function $P(x) = -5x^{-3} + 3x^2 + 500$, determine the marginal profit at producing 5 units. [4]

4.5 Given $G = 3p^2x - 2p - 3x + 4px^3$, find

4.5.1 $\frac{\partial G}{\partial x}$ and $\frac{\partial G}{\partial p}$ [6]

4.6 Find the total cost function if its marginal cost function is given as $MC = 82 - 16y + 1.8y^2$ [5]

**END OF PAPER
TOTAL MARKS:100**