"Investing in Africa's Future"

COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES

NMEC 203: MATHEMATICS FOR ECONOMISTS

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2025

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INSTRUCTIONS

Answer **Any FOUR Questions**. Total possible mark is **100.**

Start **each** question on a new page in your answer booklet.

The marks allocated to **each** question are shown at the end of the question.

Show all your workings.

Credit will be awarded for logical, systematic and neat presentations.

1. (a) Simply the following polynomial function and show how it is applicable to economics

$$(12x^2 + 9x - 21) + (4x^3 + 8x^2 - 5x + 20)$$ **[5 Marks]**

(b) Consider the following perfect square polynomial

$$(x + a)^2$$

Solve the above **[5 Marks]**

(c)Simplify $\frac{1}{x+2} + \frac{2}{x+3}$ **[5 Marks]**

(d) Simplify the following function **[5 Marks]**

$$\frac{x^2 + 4x - 5}{4x - 4} \cdot \frac{2x + 4}{x + 5}$$

(e) Discuss the application of polynomial functions in economics **[5 Marks]**

2. (a) What is a function? **[2 Marks]**

(b) Consider this set of five ordered pairs: $\{(1,2),\ (2,4),\ (3,6),\ (4,8),\ (5,10)\}$

Determine domain and range numbers **[2 Marks]**

(c) If $f(x) = x^2 + 3x - 4$ compute f (3) **[2 Marks]**

(d) Illustrate in diagrams the following functions

(i) Constant function: $f(x) = c$,
where c is a constant **[2 Marks]**

(ii) Identity function: $f(x) = x$ **[2 Marks]**

(iii) Absolute value function: $f(x) = |x|$ **[2 Marks]**

(iv) Quadratic function: $f(x) = x^2$ **[3 Marks]**

(v) Cubic function: $f(x) = x^3$ **[3 Marks]**

(vI) Reciprocal Function: $f(x) = \frac{1}{x}$

(e) Using practical examples show how the square root, reciprocal square root function are applicable to economics. **[7 Marks]**

3. (a) Consider a linear function of the form $f(x) = mx + b$. Define the function and illustrate in diagrams. **[5 Marks]**

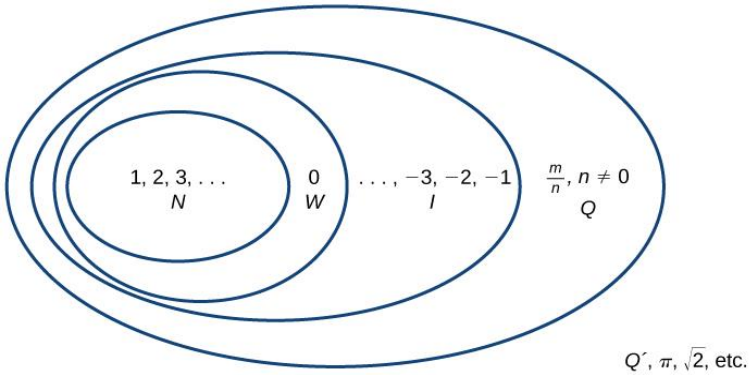
(b) Functions can be increasing, decreasing or constant, illustrate in diagrams. Explain using practical examples how these functions are applicable to economics **[5 Marks]**

(c) Write the equation of the line that passes through $(0,1)$ and $(3,2)$, compute the slope of this function **[5 Marks]**

(d) Illustrate extrapolation and interpolation a range of data. **[5 Marks]**

(e) What does a correlation coefficient close to 1 signify? **[5 Marks]**

4. (a) Consider the following set



In the context of the above set of numbers determine rational numbers, integers, natural numbers, irrational numbers and whole numbers **[5 Marks]**

(b) Illustrate the following properties of real numbers

(i) Cumulative **[2 Marks]**
(ii) Associative **[2 Marks]**
(iii) distributive **[2 Marks]**
(iv) Identity **[2 Marks]**
(v) Inverse **[2 Marks]**

(c) Demonstrate rule of exponents **[5 Marks]**

(d) Radical expressions are used in economics, using clear examples discuss the rules of radical expressions **[5 Marks]**

5. The study of calculus embraces the following key concepts

(a) Polynomials
(b) Linear functions
(c) Non-Linear functions
(d) Differentiation

You are required to demonstrate a clear understanding of the above concepts, use examples to show how each is solved and explore the product rule, quotient rule, power rule in differentiation. You are further expected to show how each is applied in economics. **[25 Marks]**

6. Constrained optimisation utilises two distinct methods

(a) The intuition approach
(b) The langrangian approach

Based on production and consumption illustrate the two methods using practical examples and interpret the results. **[25 Marks]**

END OF EXAMINATION