



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)
UNIVERSITY EXAMINATIONS (MAIN PAPER)
2023/2024 ACADEMIC YEAR**

FIRST YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
MEDICAL LABORATORY SCIENCES/MEDICAL
BIOTECHNOLOGY**

COURSE CODE: DML 115 / DMB 115

COURSE TITLE: BASIC MATHEMATICS

DATE: 7TH DECEMBER 2023

TIME: 8.00-10.00AM

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, A B and C, respectively: Multiple Choice Questions (MCQs), Short Answer Questions (SAQs) and Long Answer Questions (LAQs). Answer all questions. **DO NOT WRITE ON THE QUESTION PAPER**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over

SECTION A: Multiple Choice Questions (20 Marks)

- Which one of the following is a real number?
 - $\sqrt{2}$
 - $\sqrt{-64}$
 - $3\sqrt{2}$
- What are complex numbers?
 - Number with no surds
 - Numbers with real numbers and imaginary numbers
 - Numbers that can be plotted on the number line
 - Numbers with recurring decimal values
- What value represents the conjugate of $\sqrt{3} + \sqrt{1}$?
 - $3 + 1$
 - $\sqrt{3} - \sqrt{1}$
 - $\sqrt{3} - 1$
 - $\sqrt{3} + \sqrt{1}$
- What value is obtained after simplifying the following $\frac{4}{\sqrt{7} - \sqrt{3}}$?
 - $\sqrt{7} + \sqrt{3}$
 - $\sqrt{3} + \sqrt{7}$
 - $\sqrt{7} - \sqrt{3}$
 - $\sqrt{3} - \sqrt{7}$
- Replace the imaginary number with (i) in the following expression: $-2\sqrt{-80}$
 - $-5i8$
 - $8i\sqrt{5}$
 - $-8i\sqrt{5}$
 - $-i8\sqrt{5}$
- Which one of the following is not an area of application of binomial theorem?
 - Medical researchers
 - Quality control
 - Public opinion survey
 - Confirmation of diagnosis
- What does the symbol (!) represents in a binomial theorem formula?
 - Factorial
 - Number of items
 - Constant
 - None of the above
- Which one of the following procedures highlights the short steps involved in the chain rule differentiation method?

- A. Write the index power, differentiate the term in the bracket, repeat the term in the bracket, subtract one from the power, and multiply everything.
- B. Subtract one from the power, then multiply with everything
- C. Add one to the value in the bracket, then multiply everything.
- D. None of the above.
9. Which one of the following is not a method of differentiation?
- A. Product-sum rule
- B. Product rule
- C. Chain rule
- D. First principle
10. Which one of the following expresses the product rule used in differentiation

$$A) \sqrt{\frac{du}{dx}} + U \frac{dv}{dx}$$

$$B) U'V' + U'V'$$

$$C) V'U' + UV$$

$$D) \sqrt{\frac{dx}{dx}} + \frac{dx}{dx}$$

11. What is the product of differentiating $y = \sqrt[3]{(ax + b)^2}$
- A. $\frac{2a}{\sqrt[3]{(ax + b)}}$
- B. $2a$
- C. $3 \sqrt[3]{(ax + b)}$
- D. $ax + b$
12. Which one of the following is a binomial expression?
- A. $3x + 5$
- B. $(3x + 5)(2x - 3)$
- C. $(4x - 2) + (2x) - (x^2 + 3x - 5)$
- D. $3x + 5 + 3x$
13. Which one of the following is not a characteristic feature of a rational number?
- A. Terminating decimal
- B. Non-terminating recurring decimal
- C. Positive whole numbers
- D. Non-terminating numbers, non-recurring decimals

14. Which one of the following is not an application of definite integration

- A. Area under a curve
- B. Accumulated quantity
- C. Probability of statistics
- D. Drug abuse

15. Which of the following is not an application of functions in real life?

- A. Supply and demands
- B. Population growth
- C. Drug dosage
- D. Control theory

16. What is the outcome of differentiating $y = (x^2 + 3)(3x^2 + 5)$

- A. $4x(3x^2 + 17)$
- B. $4x(7 + 3x^2)$
- C. $3x^2 + 7 + 4x$
- D. $3x^3 + 15$

17. What is $\lim_{x \rightarrow 25} \frac{x^2 - 625}{\sqrt{5} - 5}$

- A) 0/0
- B) 50
- C) 500
- D) 5

18. Which one of the following is true about irrational numbers

- A. They have indefinite rationalizing factors
- B. They do not have surd values
- C. Irrational number must have a negative sign
- D. They are only plotted on the negative side of the number line.

19. Which one of the following is incorrect about the concept of continuity?

- A. Quadratic equations are continuous
- B. Polynomial functions are continuous
- C. Rational functions are continuous as long as the denominators are not zero.
- D. Rational functions are only continuous when the denominator is zero

20. Express $4 + \frac{\sqrt{5}}{3 - 2\sqrt{5}}$ in form of $p + q\sqrt{5}$ where p and q are rational numbers, then state the values of p and q.

- A. $p = 2, q = 1$
- B. $p = 2, q = -1$
- C. $p = 1, q = 2$
- D. $p = 1, q = -2$

SECTION B: Short Answer Questions (40 Marks)

1. (a) Express $\frac{8 - 2\sqrt{6}}{2\sqrt{3} + 3\sqrt{2}}$ in the form of $-m\sqrt{3} + n\sqrt{2}$ where m and n are rational numbers

(5marks).

(b) Simplify the following $\sqrt{25} + \sqrt{-7}$ remember to replace the irrational number with (i) (5marks)

2. (a) By checking for the limit, find the value of; $\lim_{x \rightarrow 7} \frac{x-7}{(x-7)}$ (5marks)

(x^2-49)

(b) Solve; $f(x) = \frac{x^2 - 14x + 45}{x - 9}$
 $\lim_{x \rightarrow 9} f(x)$ (5marks)

3. Solve for the value of X given

a) $X^2 - 6x + 10 = 0$ (5marks)

b) What is $\lim_{X \rightarrow 1}$

$$\frac{X^2}{(8-12x) - (2-x)^3}$$
 (5marks)

4. (a) Solve the following trinomial expression;

$$(3x^2 - 5x + 7)(2x^2 + 6x - 4)$$
 (5marks)

(b) Simplify $\frac{x^2 - x - 6}{X^2 - 6x + 9}$ (5marks)

SECTION C: Long Answer Questions (60 Marks)

1.(a) Use binomial theorem formula to solve $(x + y)^5$. Please remember to show all your working and steps. (10marks)

(b) Express 5 applications of binomial theorem in the field of medicine (5marks)

(c) Evaluate by substitution $\int 8x(3x^2-7)^{19} dx$ (5marks)

2. Differentiate the following using the first principle method

a) $y = \frac{1}{2X + 1}$ (8marks)

b) $y = x^2$ (5marks)

c) $3x^3$ (7marks)

3. (a) Evaluate $\int (4x^3 - 2x^2 + 6x + 7) dx$ (8marks)

(b) Differentiate $y = (\sqrt[5]{(mx+n)^3})$ (6marks)

(c) Use binomial theorem to solve $(a+b)^4$ (6marks)

