



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES & NATURAL RESOURCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of Science; Bachelor of Science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BSOC; 07BAMS	LEVEL: 5
COURSE CODE: CLS502S	COURSE NAME: CALCULUS 1
SESSION: JULY 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/ SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	Mrs. H. Y. Nkalle
MODERATOR:	Dr. N. Chere

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 a cover.

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

Question 1

Consider the relation $R = \{(1,9), (2,7), (1,4)\}$. Is R a function? Justify your answer. [2]

Question 2

Let $f(x) = \frac{8}{\sqrt{x^2+3x-10}}$. Use a detailed sign table to find the domain of f . [8]

Question 3

Find $\lim_{x \rightarrow 3} \frac{\sqrt{x+1} - 2}{x-3}$. [7]

Question 4

Differentiate $f(x) = \frac{24x}{6x+5}$ from first principle. [7]

Question 5

Prove that $f(x) = 3x + 5$ is injective. [4]

Question 6

Investigate whether the following functions are odd or even.

(a) $f(x) = x^2$. [2]

(b) $f(x) = \sin x$. [2]

Question 7

Show that $\frac{d}{dx} \tan x = \sec^2 x$ using quotient rule. [8]

Question 8

Let $f(x) = x(x + 1)^3$. Use detailed sign table in answering the following questions.

(a) Find the intervals in which f is increasing or decreasing. [9]

(b) Find the intervals in which the graph of $y = f(x)$ is concave upward or downward. [5]

Question 9

Let $f(x) = \begin{cases} 3x + 3c & \text{if } x \geq 2 \\ x^2 - cx & \text{if } x < 2 \end{cases}$. If $\lim_{x \rightarrow 2} f(x)$ exists, find the values of c . [6]

Question 10

Find the point on the graph of the function $f(p) = 3p^2 - p + 1$ at which the tangent line is horizontal. [12]

Question 11

Consider the function $f(x) = e^{rx}$. Determine the values of r so that f satisfies the equations $f'''(x) - 3f''(x) + 2f'(x) = 0$. [9]

Question 12

Given $f(x, y) = x \cos y^2 + \ln(1 + xy)$. Find f_x , f_{xx} , f_y and f_{yx} . [7]

Question 13

Find $\lim_{x \rightarrow a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$. [8]

Question 14

Find the average rate of change of the function $f(x) = x^3 + 4x$ over the interval $[-6; 9]$. [4]

End of paper
Total marks: 100