



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science	
QUALIFICATION CODE: 07BSOC	LEVEL: 5
COURSE CODE: CLS502S	COURSE NAME: CALCULUS 1
SESSION: JUNE 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 78

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	Dr A. S. EEGUNJOBI
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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 a cover.

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

PART A [32 marks]

1. $\lim_{x \rightarrow 7} \frac{2x^2 - 13x - 7}{x - 7}$ is
A. ∞ B. 0 C. 2 D. 15 E. 8 (3)

2. If function $f(x) = x^2 + ax + 1$ is monotonic increasing in the interval $[1, 2]$ then the minimum value of a is
A. 2 B. -1 C. -2 D. 1 E. 0 (3)

3. Consider a function $f(x)$ where $f(x) = \frac{1 - \cos 4x}{8x^2}$, if $x \neq 0$ and $f(x) = p$ if $x = 0$. If $f(x)$ is continuous function at $x = 0$ then the value of p will be
A. 0 B. 1 C. -1 D. $\frac{1}{8}$ E. None of these (3)

4. If

$$f(x) = \begin{cases} x - 5 & \text{for } x \leq 1 \\ 4x^2 - 9 & \text{for } 1 < x < 2 \\ 3x + 4 & \text{for } x \geq 2 \end{cases}$$

then $f'(2+)$ =

A. 9 B. 2 C. 3 D. 4 E. 7 (3)

5. If $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$, then $\frac{dy}{dx}$ is equal to
A. $\sec h^2 x$ B. $\operatorname{csch}^2(x)$ C. $-\sec h^2 x$ D. $-\operatorname{csch}^2(x)$ E. $\cot h^2 x$ (3)

6. Derivative of $x^6 + 6^x$ with respect to x is
A. $12x$ B. $x + 4$ C. $6x^5 - 6^{x-1}$ D. $6x^5 + x6^{x-1}$ E. $6x^5 + 6^x \log 6$ (3)

7. If $y = e^x \log x$, then $\frac{dy}{dx}$ is
A. $\frac{e^x}{x}$ B. $e^x \left(\frac{1}{x} + x \log x \right)$ C. $e^x \left(\frac{1}{x} + \log x \right)$ D. $\frac{e^x}{\log x}$ E. $e^x \left(\frac{1}{x} - \log x \right)$ (3)

8. If $\ln(x + y) = 2xy$, then $y'(0)$ = is
A. 1 B. -1 C. 2 D. -2 E. 0 (3)

9. If $xe^{xy} = y + \sin^2 x$, then at $x = 0$, $\frac{dy}{dx}$ is equal to
 A. -1 B. -2 C. 2 D. 1 E. 0 (3)

10. The radius of a cylinder is increasing at the rate of $3m/sec$ and its altitude is decreasing at the rate of $4m/sec$. The rate of change of volume when radius is 4 meters and altitude is 6 meters is
 A. $80\pi m^3/sec$ B. $144\pi m^3/sec$ C. $80m^3/sec$ D. $64\pi m^3/sec$ E. $64m^3/sec$ (5)

PART B [46 marks]

1. (a) Determine $\frac{dy}{dx}$ in terms of x if $y = \arcsin 3x$ (5)

(b) Determine, using logarithm differentiation $\frac{dy}{dx}$ if $y = \frac{e^{3x} \sin 2x}{2^x}$ (7)

2. The parametric equations of a cycloid are $x(\theta) = 4(\theta - \sin \theta)$, $y(\theta) = 4(1 - \cos \theta)$. Determine (a) $\frac{dy}{dx}$ (b) $\frac{d^2y}{dx^2}$ (6)

3. Determine the first derivative (*i.e.* $\frac{dy}{dx}$) if $f(x) = \sin(\log x)$, and $y = f\left(\frac{2x+3}{3-2x}\right)$ (8)

4. In the Mean-Value theorem

$$f'(c) = \frac{f(b) - f(a)}{b - a},$$

if

$$a = 0, \quad b = \frac{1}{2}, \quad \text{and} \quad f(x) = x(x-1)(x-2),$$

find the value of c that lies between a and b . (10)

5. The length x of a rectangle is decreasing at the rate of $2cm/sec$ and the width y is increasing at the rate of $3cm/sec$. When $x = 12cm$ and $y = 5cm$. Find the rate of change of:

(a) the perimeter (5)

(b) the area of rectangle (5)

End of Exam!