



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science; Bachelor of science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BSOC; 07BAMS	LEVEL: 6
COURSE CODE: CLS601S	COURSE NAME: CALCULUS 2
SESSION: JANUARY 2020	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
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MODERATOR:	Dr V. KATOMA

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)

1.1. Let $f(x) = 2 + 6x - 3x^2$. Then

1.1.1. find the average value of f on $[0, 1]$ [3]

1.1.2. find a point c on $[0, 1]$ such that $f_{\text{ave}} = f(c)$. [5]

1.2. Determine whether the following sequence converges or diverges. If it converges determine where it converges.

1.2.1. $\left\{ \frac{1}{n+3} \right\}_{n=1}^{\infty}$ [4]

1.2.2. $\left\{ \frac{\sqrt{n}}{n} \right\}_{n=1}^{\infty}$ [4]

1.2.3. $\left\{ \frac{\ln(n)}{n} \right\}_{n=1}^{\infty}$ [4]

1.3. Let $f(x) = e^{-x}$. Then determine the third order Taylor polynomial approximation of f about $x = 0$. [7]

1.4. Let $G(x) = \int_1^{4x} \sqrt{1+t^4} dt$. Use the fundamental theorem of calculus to find $G'(x)$. [6]

1.5. Evaluate the following indefinite integrals.

1.5.1. $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$ [Use integration by substitution] [4]

1.5.2. $\int x^{-2} \ln x dx$ [Use integration by parts.] [6]

1.6. Evaluate the following definite integrals.

1.6.1. $\int_1^3 (3x^2 + 2x + \frac{1}{x^2}) dx$ [4]

1.6.2. $\int_{\frac{1}{\pi}}^{\frac{2}{\pi}} \frac{1}{x^2} \sin\left(\frac{1}{x}\right) dx$ [use integration by substitution.] [6]

1.7. Determine whether the following series converges or diverges. If it converges find the sum.

1.7.1. $\sum_{k=0}^{\infty} \left(\left(\frac{3}{4}\right)^k - \left(\frac{2}{3}\right)^k \right)$ [11]

1.7.2. $\sum_{k=1}^{\infty} (-1)^k \frac{1}{2^k}$ [4]

1.8. Find the interval of convergence and radius of convergence for the power series

$$\sum_{k=1}^{\infty} \frac{(x-1)^k}{k+1} \quad [10]$$

1.9. Consider the region enclosed by the curves $y = 2x$, $y = x^2$. Then

- 1.9.1. find the area of the region enclosed by the curves $y = 2x$, $y = x^2$. [6]
- 1.9.2. find the center of mass of the lamina enclosed by the region
 $y = 2x$, $y = x^2$ [7]
- 1.9.3. find the volume of the solid generated when the region between the curves $f(x) = x^2$
and $g(x) = 2x$ revolved about the x-axis. [4]
- 1.10. Use the Trapezoidal rule to approximate $\int_1^4 \sqrt{x + \ln x}$ with $n = 6$. [5]

END OF EXAMINATION