

**SIR ARTHUR LEWIS COMMUNITY COLLEGE
SCIENCE, TECHNOLOGY, INNOVATION AND SUSTAINABILITY**

**2024 – 2025 ACADEMIC YEAR - SEMESTER I
END OF SEMESTER EXAMINATION**

COURSE TITLE : **CALCULUS II**

COURST CODE : **MAT209**

LECTURER : **Mr. JOHN ESTEPHANE**

DATE : **Tuesday 10th December 2024**

TIME : **1.00 – 3.00 PM**

DURATION : **2 HRS**

STUDENT ID# :

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Write your student's ID number on all the work you hand in.
2. This paper consists of EIGHT (8) questions
3. Answer *all* the questions in the space provided
4. Write in BLACK or BLUE pen. (**NO WRITING IN PENCIL**)
5. Show all calculations and working.
6. **Only NON-PROGRAMMABLE calculators are permitted.**
7. Do not use correction fluid.

Question	Score	Max. Score
1		5
2		6
3		14
4		15
5		10
6		8
7		6
8		8
Total		72

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO

1. Find $2 \int \sin 7x \cos 2x \, dx$

[5]

2. Use integration by parts to find $\int x^2 \sin x \, dx$

[6]

3. The parametric equations of a curve are $x = t^2 + 2t - 1$, $y = t^4 + 7t^2 + 6t$.

a. Find $\frac{dy}{dx}$ in terms of t .

[4]

- b. Hence find equation of the tangent and normal to the curve at the point with parameter $t = 1$ in the form $y = mx + c$ [6]

- c. Find $\frac{d^2y}{dx^2}$ [5]

4. Find the real constants A, B and C such that

a. $\frac{4x^2+4x+16}{(x+2)(x^2+1)} = \frac{A}{x+2} + \frac{Bx+C}{x^2+1}$ [8]

b. Hence evaluate $\int \frac{4x^2+4x+16}{(x+2)(x^2+1)} dx$ [7]

5. Find the general solution for the differential equation $x \frac{dy}{dx} - y = x^2$. [10]

6. Find the volume of the solid of revolution formed by revolving the region bounded by the curve $y = 3x - 2x^2$, the x -axis, and the lines $x = 0$ and $x = 3$ is rotated through 360° the x -axis. [8]

7. Determine the arc length of $y = \frac{4}{3}x + 2, 0 \leq x \leq 9$ using the $\left[L = \int_b^a \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \right]$ [6]

8. Let $f(x) = \sqrt{x}$ over the interval $[1, 3]$. Find the surface area of the object generated by revolving the graph of $f(x)$ around the x - *axis*. Round your answer to three decimal places.

$$A = 2\pi \int_a^b f(x)\sqrt{1 + [f'(x)]^2} dx$$

[10]

END OF EXAMINATION