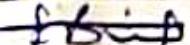


Candidate's Index Number
161MAT1K612110109
Signature: 

UNIVERSITY OF CAPE COAST
 COLLEGE OF EDUCATION STUDIES
 SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
 INSTITUTE OF EDUCATION

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME
 LEVEL 400, END-OF-FIRST SEMESTER EXAMINATION, JANUARY 2023

8TH JANUARY 2023

ADVANCED CALCULUS I

4:40 PM - 6:00 PM

SECTION B
[40 MARKS]

Answer any TWO questions from this section.

- 1.
- a. Evaluate $\lim_{(x, y) \rightarrow (0, 0)} \frac{xy^2}{x^2+y^4}$. [12 marks]
- b. Determine if the function $f(x, y) = \begin{cases} \frac{x^4}{x(x^2 + y^2)}, & \text{if } (x, y) \neq (0, 0) \\ 0, & \text{if } (x, y) = (0, 0) \end{cases}$ is continuous at $(0, 0)$. [8 marks]
- 2.
- a. Given that $R = \ln(u^2 + v^2 + w^2)$, where $u = x + 2y$, $v = 2x - y$, and $w = 2xy$, use the Chain Rule to find
 (i) $\frac{\partial R}{\partial x}$ [4 marks]
 (ii) $\frac{\partial R}{\partial y}$ [4 marks]
- b. Evaluate $\iint_R (3x + 4y^2) dA$, where $R = \{(r, \theta) : 1 \leq r \leq 2, 0 \leq \theta \leq \pi\}$. [12 marks]

- 3.
- a. Use polar coordinates to evaluate

$$\int_0^2 \int_0^{\sqrt{2x-x^2}} \sqrt{x^2 + y^2} dy dx.$$

[12 marks]

- b. Evaluate the triple integral $\iiint_B xyz^2 dV$, where B is the rectangular box given by $B = \{(x, y, z) : 0 \leq x \leq 1, -1 \leq y \leq 2, 0 \leq z \leq 3\}$. [8 marks]

4. Use the change of variables $x = \frac{1}{2}(u + v)$ and $y = \frac{1}{2}(v - u)$ to evaluate the integral $\iint_R \frac{e^{(x-y)}}{x+y} dA$ where R is the rectangle bounded by the lines $y = x$, $y = x + 5$, $y = 2 - x$ and $y = 4 - x$. [20 marks]