AUGUST 2020
MAT 301SW
ADVANCED CALCULUS I
1 HOUR 20 MINUTES

Candidate's Index Number

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
SECOND YEAR, SECOND SEMESTER EXAMINATION, AUGUST 2020

AUGUST 29, 2020 ADVANCED CALCULUS I 2:40 PM – 4:00 PM

SECTION B

Answer any TWO questions from this section.

1. a. Evaluate $\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4}$. [12 marks]

    b. Determine if the function
    $$f(x,y) = \begin{cases} \frac{x^4}{x(x^2+y^2)}, & if \ (x,y) \neq (0,0) \\ 0, & if \ (x,y) = (0,0) \end{cases}$$
    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
    $R = \{(r,\theta) : 1 \le r \le 2, 0 \le \theta \le \pi\}$. [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
    $B = \{(x,y,z) : 0 \le x \le 1, -1 \le y \le 2, 0 \le z \le 3\}$. [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]