

FACULTY OF ENGINEERING SCIENCES AND TECHNOLOGY

Department: **Computer Science**

Program: **BS**

Multivariate Calculus

Announced date: 13-08-24

Due Date: 20-08-24

Total Marks = 05

Assignment 1

Mapped CLO	SDG	Knowledge Profile	Complex Problem Solving Mapped
CLO1	4 & 9	WK2 (Mathematics)	GA – 2 (Knowledge for Solving Computing Problems)

Problem Statement:

Q1.

The temperature T (in $^{\circ}\text{C}$) at any point in the region $-10 \leq x \leq 10$, $-10 \leq y \leq 10$ is given by the function

$$T(x, y) = 100 - x^2 - y^2.$$

(a) Sketch isothermal curves (curves of constant temperature) for $T = 100^{\circ}\text{C}$, $T = 75^{\circ}\text{C}$, $T = 50^{\circ}\text{C}$, $T = 25^{\circ}\text{C}$, and $T = 0^{\circ}\text{C}$.

Q2.

Show that the function f does not have a limit at $(0, 0)$ by examining the limits of f as $(x, y) \rightarrow (0, 0)$ along the line $y = x$ and along the parabola $y = x^2$:

$$f(x, y) = \frac{x^2 y}{x^4 + y^2}, \quad (x, y) \neq (0, 0).$$

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Q3.

By approaching the origin along the positive x -axis and the positive y -axis, show that the following limit does not exist:

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x + y^2}{2x + y}.$$

Q4.

Explain why the following function is not continuous along the line $y = 0$:

$$f(x, y) = \begin{cases} 1 - x, & y \geq 0, \\ -2, & y < 0. \end{cases}$$

Q5.

What value of c makes the following function continuous at $(0, 0)$?

$$f(x, y) = \begin{cases} x^2 + y^2 + 1 & \text{if } (x, y) \neq (0, 0) \\ c & \text{if } (x, y) = (0, 0) \end{cases}$$

Q6.

find the domain of the given function.

$$f(x, y) = \frac{1}{x} + \sqrt{y+4} - \sqrt{x+1}$$

$$f(x, y) = \ln(2x - 3y + 1)$$

$$f(x, y, z) = \frac{1}{x^2 + y^2 + 4z}$$