COMSATS University Islamabad, Lahore Campus
Defence Road, Off Raiwind Road, Lahore.

Mid-Term Examination – Fall 2021

Course Title:	Multivariable Calculus				Course Code:	MTH105	Credit Hours: 3(3,0)
Course Instructor/s:	Dr. Aqeel Khan				Programme Name:	BCS	
Semester:	3rd	Batch:	FA21	Section:		Date:	10-05-2022
Time Allowed:	**90 Minutes**				**Maximum Marks:**		**25**
Student's Name:					Reg. No.		

Important Instructions / Guidelines:

- Attempt all the questions.

Section 1

Question 1 **(5+5 marks)**

(A): Find the area **"inside"** the figure eight $r = 1 + \cos 2\theta$ and **"outside"** the circle $r = 1$.

(B): Find the length of the curve $r = 2\sin^3\left(\frac{\theta}{3}\right)$ for the range $0 \leq \theta \leq 3\pi$ in the polar coordinate plane.

Section 2

Question 2 **(4+4+7 marks)**

(A) Find parameterizations for the lines in which the following planes intersect:

$$x - 2y + 4z = 2 \quad \text{and} \quad x + y - 2z = 5$$

(B) Is the line $x = 1 + 2t, y = -2 + 3t$ and $z = -5t$ related in any way to the plane $-4x - 6y + 10z = 9$. Give reasons for your answer.

(C) Find the domain, range, level surfaces and first partial derivatives of the given function:

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