National University of Computer & Emerging Sciences, Karachi
Fall 2022 CS-Department
Sessional-I
28th September, 2022, 10:00 am – 11:00 am

Course Code: MT 1003	**Course Name: Calculus and Analytical Geometry**
Instructor Name / Names: Ms. Fareeha Sultan, Ms. Asma Masood, Mr. Nadeem Khan, Ms. Urooj, Mr. Usama Antuley	
Student Roll No:	**Section No:**

- Read each question completely before answering it. There are **4 questions and 2 pages.**
- Answer all questions in the answer copy.
- Solve all the questions.
- Scientific calculator is allowed.
- Return the question paper.

Time: 60 minutes. **Max Marks**: 30 points

Q1. **(CLO 1)** $[3 + 3 = 6]$

a) Solve the inequality and sketch the solution on the coordinate line.

$$\frac{3}{x-5} \leq 2$$

b) Solve for x.

$$\left|\frac{x+5}{2-x}\right| = 6$$

Q2. **(CLO 2)** $[3 + 3 = 6]$

a) Find the formula for $f \circ g$ and $g \circ f$, and state the domains of the functions.

$$f(x) = \frac{x}{1+x^2}, \quad g(x) = \frac{1}{x}$$

b) Find a formula for $f^{-1}(x)$.

$$f(x) = \begin{cases} \frac{7}{2} - x & x < 2 \\ \frac{3}{x} & x \geq 2 \end{cases}$$

Q3. **(CLO 3)** $[3 + 3 = 6]$

a) Evaluate the limit.

$$\lim_{x \to 4} \frac{4-x}{2-\sqrt{x}}$$

b) Find the values of x at which $f(x)$ is not continuous, and determine whether each such value is a removeable discontinuity.

$$f(x) = \frac{2x+1}{x^2+6x+9}$$

Q4. **(CLO 3)** [3 + 3 + 3 = 9]

a) Find $\left.\frac{d^2y}{dx^2}\right|_{x=2}$

$$y = \frac{3x-2}{5x}$$

b) Find $F'(x)$

$$F(x) = \frac{sinx\ cscx}{1+xtanx}$$

c) Find $\frac{dy}{dx}$ by implicit differentiation.

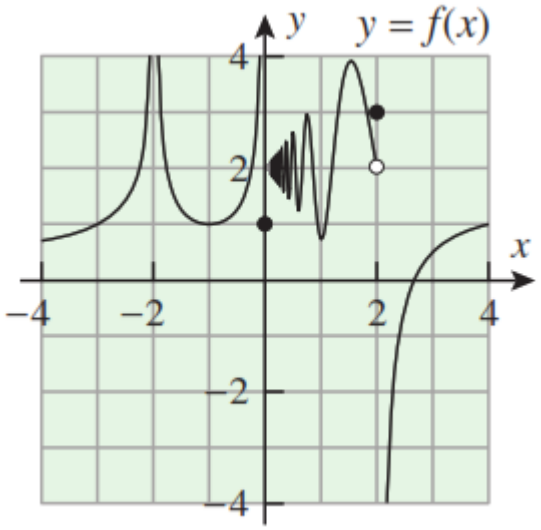
$$tan^3(xy^2+y) = x$$

Q5. **(CLO 3)** [1.5 + 1.5 = 3]

Discuss continuity of $y = f(x)$ whose graph is given below at

a) $x = 0$

b) $x = 2$



GOOD LUCK