National University of Computer & Emerging Sciences, Karachi
Fall-2023 FAST School of Computing
Mid-Term - I Exam
26 September 2023

Course Code: MT – 1003	**Course Name: Calculus and Analytical Geometry**
Instructor Name: Ms. Urooj / Ms. Alishba Tariq / Ms.Fareeha sultan / Mr. Nadeem Khan / Mr. Mairaj ahmed	
Student Roll No:	**Section No:**

Instructions:

- Attempt all questions. There are **03 Questions and 02 pages**.
- Solve the paper according to the sequence given in the question paper.
- Graphical Calculator is not allowed.
- Return the question paper with the answer copy.

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

Question 01: **CLO1** **[2.5 + 2.5 = 5]**

a) Find three smallest consecutive whole numbers x, x+1 and x+2 such that the difference between one-fourth of the largest and one fifth of the smallest is at least 3. According to given statements equation inequalities is

$$\frac{x+2}{4} - \frac{x}{5} \geq 3$$

b) Solve the inequality for value of *x*, and also draw the solution on real line.

$$\frac{3}{|2x-3|} < 4$$

Question 02: **CLO2** **[4 + 3 + 3 = 10]**

a) Express the function in piecewise form without using absolute values. Then find inverse of piecewise function.

$$f(x) = |x+3| + 2x$$

b) Find domain and range of the function $f(x) = \sqrt{4-x} + 5$ and also Sketch the graph of $f(x)$.

c) If $f(x) = \frac{1}{x^2+1}$ and $g(x) = \sqrt{x-1}$ then

i. Find fog.

ii. Write Domain of fog.

iii. fog is odd or even?

Question 03: **CLO3** **[6 + 2 + 5 + 2 = 15]**

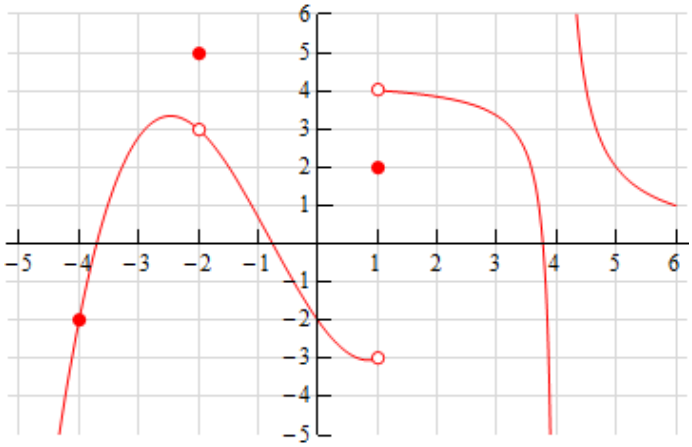
a) Find the derivative $\frac{dy}{dx}$ of the following

i. $\cos(x^2 + 2y) + e^y = x$

ii. $y = \ln(\sec 2x + \tan 2x)^{\frac{1}{2}}$

b) If $f(2) = -8, f'(2) = 3, g(2) = 17$ *and* $g'(2) = -8$, Find the value of $(fg)'(2)$.

c) Use the given graph of $f(x)$ to



i. Find $\lim_{x\to 1} f(x)$, $\lim_{x\to 4} f(x)$ and $\lim_{x\to -2} f(x)$.

ii. List all the open intervals in which graph is continuous?

d) The candy factory sells candy by the pounds, charging 1.50 per pound for quantities up to and including 20 pounds. Above 20 pounds , the candy factory charges 1.25 per pounds for the entire quantity , plus a quantity surcharges k. If x represents the number of pounds the price function is

$$p(x) = \begin{cases} 1.50x, & for\ x \le 20. \\ 1.25x + k, & for\ x > 20\,. \end{cases}$$

Find k such that the price function $p(x)$ is continues at $x = 20$.

The End