National University of Computer and Emerging Sciences

FAST School of Computing | Fall-2023 | Islamabad Campus

MT1003 Calculus and Analytical Geometry

BS SE, BS AI, BS DS, BS CY

Tuesday, 26th September, 2023

Course Instructors

Naqeeb ur Rehman, Imran Shahzad, Ahtsham ul Haq, Arif Hussain

Serial No:

Sessional Exam-I

Total Time: 1 Hour

Total Marks: 50

Signature of Invigilator

Student Name _____ Roll No. _____ Course Section _____ Student Signature _____

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space, write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have **seven (7)** different printed pages including this title page. There are total of **6** questions.
5. Calculator sharing is strictly prohibited.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

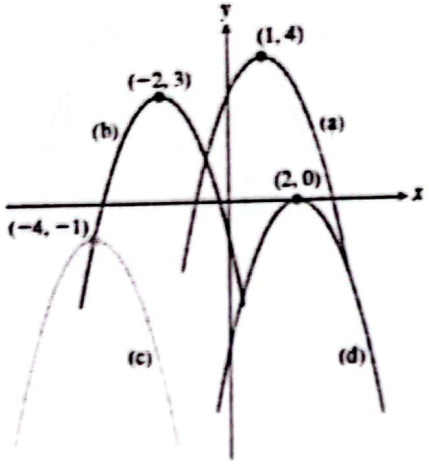
	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Total
Marks Obtained							
Total Marks	10	10	10	05	05	10	50

Question 1 [10 Marks]

A. Find domain and range for the given function.

$$y = \sqrt{\frac{x^2 - 9}{x - 4}}.$$

B. The graph given below is the graph of $y = -x^2$ shifted to four new positions. Write an equation for each new graph.



Question 2 [10 Marks]

Find the horizontal asymptotes of the graph of

$$f(x) = \frac{x^3 - 2}{|x|^3 + 1}.$$

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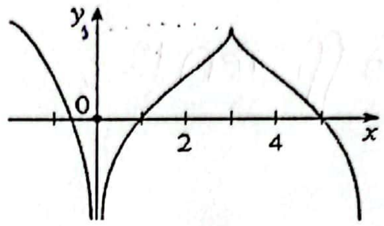
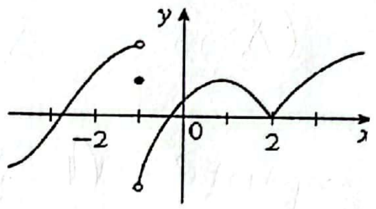
Question 3 [10 Marks]

The graphs of two functions are given. State, with the reason, the point(s) where given functions are not differentiable.





Question 4 [05 Marks]

Find an equation for the line perpendicular to the tangent to the curve $y = x^3 - 4x + 1$ at the point (2,1).

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Question 5 [05 Marks]

Find the first derivative of the function defined by $f(x) = xe^{-x}\sec x$.

Question 6 [10 Marks]

Show that a function defined by

$$f(x) = \begin{cases} x^2 \sin\frac{1}{x}, x \neq 0 \\ 0, \quad x = 0 \end{cases}$$

is differentiable at $x = 0$ and find $f'(0)$.