



Final Exam, Spring -2020
Monday 29th June 2020, 9 am – 12 noon

Course Code: MT-119	Course Name: Calculus and Analytical geometry
Instructor Names: Mr.Jamil Usmani , Mr.Nadeem khan	
Student Roll No:	Section No:

Instructions

- Attempt all question. **WRITE YOUR ID ON TOP OF EVERY PAGE by your hand.**
Write also **page # on every page. You should also sign on every page**
- Read each question completely before answering it. There are **8 questions and 3 pages**.
- All the answers must be solved according to the sequence given in the question paper.
- You will attempt this paper **offline**, in your **hand writing**.
- You may use **cam-scanner, MS lens** or any equivalent application to scan and convert your hand-written answer sheets in a **single PDF file**.
- The paper should be submitted using **Google Classroom**. You are given 30 minutes for this purpose, which is already included in the exam time mentioned above. Additionally, after submitting, you should **email** it to your instructor which should be exactly same pdf as uploaded earlier.
- No submission will be accepted after the specified time. **(After 12:30 pm)**.

Time: 3 hours

Max.Marks:100 points

Question 1 **Estimated Time: 25 minutes** **Marks (3+3+3+6)**

- Find domain and range of the function $f(x) = \sqrt{x^2 - 4}$
- Check whether the function $f(x) = \sqrt{3}$ is even, odd or neither.
- Find the average rate of change of $y = \frac{1}{x^2}$ with respect to 'x' over the interval [1,2]
- Use $A = \lim_{n \rightarrow \infty} \sum_{k=1}^n f(x_k) \Delta x$ with $x_k = a + (k - 1)\Delta x$ as a left end point of each subinterval to find the area under the curve $f(x) = 5 - x$, over [0,5]

Question 2**Estimated Time: 30 minutes****Marks (5+7+3)**

- a) Write Increasing and decreasing interval of $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$.
- b) Discuss Concavity , Inflection point and extreme values for the curve $f(x) = x^4 - 4x^3$
- c) Find the absolute maxima and minima values of $f(x) = x^3 - 3x^2 + 1$, $[\frac{-1}{2}, 4]$

Question 3**Estimated Time: 25 minutes****Marks (15)**

- a) Find area of region enclosed by the curves $x^2 = y$ and $y = 2x - x^2$
- b) Find the volume of the solid using washer method when the region enclosed by given curves $y = x^2$, $y = x$ is revolved about the x-axis.
- c) Determine the arc length of parabola $y^2 = x$ from (0,0) to (1,1)

Question 4**Estimated Time: 10 minutes****Marks (10)**

- a) Use reduction formula to evaluate $\int \sec^6 x \, dx$
- b) Evaluate $\int \frac{dx}{1+\sin x+\cos x}$, use $u = \tan(\frac{x}{2})$

Question 5**Estimated Time: 20 minutes****Marks (10)**

- a) Find $\frac{dy}{dx}$ if $y = \sinh^{-1}\left(\frac{1}{x}\right) + \sinh(\cos 3x)$
- b) Solve the improper integrals
- I. $\int_2^5 \frac{dx}{\sqrt{x-2}}$
- II. $\int_0^{+\infty} x e^{-x^2} dx$

Question 6**Estimated Time: 30 minutes****Marks (15)**

Evaluate the integrals use indicated method (any three)

a) $\int x^3 \sqrt{2x+1} \, dx$ (by parts)

b) $\int \frac{\sqrt{9-x^2}}{x^2} \, dx$ (Trigonometric substitution)

c) $\int \frac{2x^2-x+4}{x^3+4x} \, dx$ (Partial fraction)

d) $\int \frac{x}{\sqrt{3-2x-x^2}} \, dx$ (Completing square)

Question 7**Estimated Time: 20 minutes****Marks (10)**a) Find the equation of plane that passing through points $P(1,3,2), Q(3,-1,6), R(5,2,0)$ b) Find the distance between given skew lines L_1 and L_2

$$L_1: x = 1 + t, y = -2 + 3t, z = 4 - t$$

$$L_2: x = 2t, y = 3 + t, z = -3 + 4t$$

Question 8**Estimated Time: 20 minutes****Marks (3+7)**a) Find the angle between the plane $x + y + z = 1$ and $x - 2y + 3z = 1$ b) Consider $A(1,4,6), B(-2,5,-1), C(1,-1,1)$

I. Find a vector perpendicular to the plane that passes through given points

II. Find the area of triangle with given vertices.

ALL THE BEST