



COMSATS University Islamabad
Terminal, Spring 22

Programs: BSE, BCS, BCT, BAI, BDS (II)

Subject: Calculus and Analytical Geometry (MTH:104)

Time: 3 hours

Max Marks: 50

Date: September 2022

Instructions for attempting paper:

1. Carrying of digital diaries and mobile phones are not allowed in the examination hall.
2. Sharing of anything is forbidden.
3. Unnecessary detail may lead to negative marking.

1. [Marks 5] Find formulas for $f \circ g$ and $g \circ f$, and state these domains of the compositions.

$$f(x) = \frac{1+x}{1-x} \quad g(x) = \frac{x}{1-x}$$

2. [Marks 5] Find the limit: $\lim_{y \rightarrow -\infty} \frac{2-y}{\sqrt{7+6y^2}}$

3. [Marks 5] Use L'Hopital's Rule to find limit: $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$

4. [Marks 5] Find relative extrema of $f(x) = x^4 - 12x^3$.

5. [Marks 7] Sketch the region enclosed by the curves $y = x^2$, $x = y - 2$.

6. [Marks 8] Sketch the region enclosed by the curves $y = x^3$, $y = x^2$ in the first quadrant and revolve about x-axis.

7. [Marks 5] Evaluate by using partial fraction

$$\int \frac{11x + 17}{2x^2 + 7x - 4} dx$$

8. [Marks 5] Use the Integral Test to determine whether the series converge or diverge.

$$\sum_{k=1}^{\infty} \frac{1}{\sqrt{k^2 + 1}}$$

9. [Marks 5] Use Ratio Test to determine whether the series converges or diverges or no conclusion for the series

$$\sum_{k=1}^{\infty} \frac{k!}{k^3}$$

Best of Luck