COMSATS University Islamabad

Department of Computer Science

Terminal Exam SP 2025

SP24-BCT-027
Hammad

Program: BCT-IIIA, BDS-IIIA
Subject: Calculus and Analytical Geometry
Name of Instructor: Dr. S. Noreen

Total Marks: 50
Time Allowed: 3 Hours
Date: 4 July 2025

Instructions for attempting paper:

1. Mobile phones are not allowed in the examination hall.
2. Sharing of anything is forbidden.

Ques. 1: **(05)**

Find formulas of $f \circ h$ and f / h and their respective domains.

$f(x) = \sqrt{x}$ and $h(x) = 4 - x^2$.

Ques. 2: **(05)**

Sketch the graph the given piece wise function and discuss its continuity at $x = 1$

$$f(x) = \begin{cases} x^2 - 1 & -1 \le x \le 0 \\ 2x & 0 < x < 1 \\ 0 & x = 1 \end{cases}.$$

Ques. 3: **(05)**

Evaluate the limit

$$\lim_{x \to 0} (e^x + x)^{1/x}$$

Ques. 4: **(05)**

A girl flies a kite at height of 300ft, the wind carrying the kite horizontally away from her at the rate of 25ft/sec. How fast must she let out the string when kite is 500 ft away from her?

Ques.5: **(05)**

Find the arc length of curve $f(x) = x^{3/2}$ from $(1, 1)$ to $(2, 2\sqrt{2})$.

Ques. 6: **(05)**

A manufacturer is analysing the cost function $f(x)$ where x represents the number of units produced. Identify the concavity of this cost function.

$$f(x) = x^4 - 12x.$$

Ques. 7: **(05)**

Consider three distinct curves, a straight boundary $g(x)$, a curved boundary $f(x)$, and a horizontal boundary $h(x)$ given by

$$f(x) = \sqrt{x}\,,\ g(x) = -\frac{x}{4} \text{ and } h(x) = 4.$$

a) Sketch the region R that is enclosed by these curves.
b) Calculate the area of the region R,

Ques. 8: **(05)**

Find the volume of the solid generated when the region between the graphs of the equations!

$f(x) = x^2 + \frac{1}{2}$ and $g(x) = x$ over the interval $[0,2]$ is revolved about $x-$ axis.

Ques. 9: **(05)**

State the Maclaurin Series representation of function

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

Ques. 10: **(05)**

Find the interval of convergence and radius of convergence of the following power series

$$\sum_{k=0}^{\infty} \frac{(-1)^k \; x^k}{3^k \; (1+K)}$$