



COMSATS University Islamabad
Department of Computer Science
Midterm Exam Fall 2025

Program : BCS-III
Teacher: Dr. M. Yousaf
Subject: Calculus and Analytical Geometry

Total Marks : 25
Time Allowed: 1 hr & 20 min
Date 31-10-2025

Attempt all questions

- Q.1 Sketch the graph of the equation $y = 3 - \sqrt{x+1}$ by making translating, reflecting, and compressing/stretching the graph of $y = \sqrt{x}$ appropriately.
- Q.2 During the first 40 s of a rocket flight, the rocket is propelled straight up so that in t seconds it reaches a height of
- $$s = 0.3 t^3 \text{ ft}$$
- What is the instantaneous velocity of the rocket at the end of 40 s?
- Q.3 A particle is moving along the curve $y = x \ln x$. Find all values of x at which the rate of change of y with respect to time is three times that of x , assuming dx/dt is never zero. Also, find the $\lim_{x \rightarrow 0^+} (x \ln x)$ using L-Hopital rule.
- Q.4 Show that

$$f(x) = \begin{cases} x \sin(1/x) & x \neq 0 \\ 0 & x = 0 \end{cases}$$

is continuous at $x = 0$. Determine whether f is differentiable at $x = 0$. If so, find the value of the derivative there. Sketch the graph of f near $x = 0$.

- Q.5 Find: (a) the intervals on which f is increasing, (b) the intervals on which f is decreasing, (c) the open intervals on which f is concave up, (d) the open intervals on which f is concave down, and (e) the x -coordinates of all inflection points.

$$f(x) = x^2 - 3x + 8$$