



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid-Term Examination, Fall 2025

Course Code: MAT101, Course Title: Mathematics I

Level: 1 Term: 1 Batch: 70

Time: 01:30 Hrs

Marks: 25

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	Define function with example. If $f(x) = \sqrt{2x+1}$ then Demonstrate the inverse of $f(x)$.	3	CO1
	b)	Demonstrate the Differentiability of the following function at the point $x = \frac{\pi}{2}$ $f(x) = \begin{cases} 2 + \sin x; & x < 0 \\ 1 + \cos x; & 0 \leq x < \frac{\pi}{2} \\ 1 + \left(\frac{\pi}{2} - x\right); & x \geq \frac{\pi}{2} \end{cases}$	4	
2.		Find the solution of the inequality $\frac{x^2 + 8x + 15}{x^3 - 14x^2 + 40x} \geq 0$ using sign table.	3	CO1
3.		State the Remainder Theorem. Apply the Remainder Theorem to solve the following polynomial equation $x^6 - 14x^4 + 11x^3 + 12x^2 = 0$	5	CO2
4.	a)	If $y = \sin\left(e^{\ln(\sin^{-1} x)}\right)$ and $z = (\sin x)^{x^2}$ then examine the rate of change of z with respect to y or $\frac{dz}{dy}$.	3	CO3
	b)	If $y = a^x + \log x + \ln x + \log_a x + \cos e^{-1}x + e^{3x}$ then inspect the rate of change of y with respect to x , or $\frac{dy}{dx}$.	3	
	c)	A stone is rolling down an inclined plane, and its path is given by $y = \sec^{-1}\left(\frac{1+t^2}{1-t^2}\right) + \tan^{-1}\left(\frac{\cos t}{1+\sin t}\right)$ Then, inspect the slope of the path at $t = 0.5$.	4	