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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Fall 2026
Course Code: MAT101; Course Title: Mathematics I
Batch: 48; Section: A-O; Teachers Initial: MMH, ZT, MSIM, NDP, MMK

Time: 1 Hour 30 Minutes **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.	**Explain** the followings: a. Bijective Function, it's condition with a suitable example. b. Geometrical meaning of differentiation. c. The concept of limits for a real-valued function $f(x)$.	1 1 1	
2.	a. **Compute** the domain and range of the following function $$g(x) = \frac{2x+1}{5x+6}$$	2	
	b. **Express** the following function graphically, and comment about the region which can't be the range from the graph. $$f(x) = \begin{cases} x^2 - 1 & ; x < 0 \\ x & ; 0 \le x < 1 \\ \frac{2}{x} & ; x \ge 1 \end{cases}$$	3	CLO-1 L-2
	c. **Express** the following absolute value function into a piecewise function $$f(x) = \lvert x-1 \rvert + \lvert 2x+1 \rvert + \lvert x \rvert$$	2	
3.	a. **Compute** the continuity of the following function at $x = \frac{\pi}{2}$, $$f(x) = \begin{cases} 1 + \sin x \ ; & x < \frac{\pi}{2} \\ 2 + \left(x - \frac{\pi}{2}\right)^2 \ ; & x \ge \frac{\pi}{2} \end{cases}$$	3	
	b. **Compute** $\frac{dy}{dx}$ for $(\cos x)^y = (\sin y)^x$	3	CLO-2 L-3
	c. **Compute** $\frac{dy}{dx}$ for $y = x^x + (\sin x)^{\ln \sqrt{x}}$	3	

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	d. **Compute** the derivative of $x^{\ln\sqrt{a^{\cos^{-1}x}}} + a^{2^x}$ with respect to $cot^{-1}\frac{x}{\sqrt{1-x^2}}$	3	
	e. If $y = (ax + b)^n$ then **calculate** y_n, y_s, and y_p where, $s < n$ and $p > n$.	3	

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