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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Summer 2026
Course Code: MAT101; Course Title: Mathematics I
Batch: 47; Section: A-H; Teachers Initial: MMH, SST, AMS

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. Function with a suitable example b. Geometrical meaning of differentiation c. Concept of homogeneous function	3×1=3	
2.	a. **Compute** the domain and range of the following function $f(x) = \sqrt{3x + 10}$ b. **Express** the following function graphically, and comment about its domain and range from the graph. $f(x) = \begin{cases} x^2 - 1 & ; x < -1 \\ -\sqrt{1 - x^2} & ; -1 \le x < 1 \\ x & ; x \ge 1 \end{cases}$ c. **Express** the following absolute value function into a piecewise function $f(x) = \lvert 2x + 1 \rvert - \lvert x - 5 \rvert + \lvert x \rvert$	2 3 2	CLO-1 L-2
3.	a. **Compute** $\frac{dy}{dx}$ for $y = (\tan x)^{\cot x}$ b. **Compute** the derivative of $y = \sin(ln\, x)\, e^{\cos x}$ c. **Compute** the derivative of $x^{\ln\sqrt{e^{\cos^{-1}x}}} + e^{2^x}$ with respect to $\tan^{-1}\frac{x}{\sqrt{1-x^2}}$ d. If $y = \frac{1}{a^n x + b^n}$ then **calculate** the *n-th* derivative of y, also compute y_{12} e. If $u = cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then **show** that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + \frac{1}{2}\cot u = 0$	5×3=15	CLO-2 L-3