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Daffodil International University

B. Sc. in Information and Communication Engineering

Mid Term Examination, Fall 2026

Course Code: MAT 1031 **Course Title:** Calculus and Ordinary Differential Equation

Section: A **Teacher's Initial:** MN

Full Marks: 25 **Date:** 31 Oct 2026 **Time:** 1.5 Hours

Note: *Answer all of the following questions. Right hand margin indicates full marks.*

No.	Question	Marks
1.	Define odd and even function. Identify whether the following functions are odd or even: *(CLO1, C3)* (i) $\sin^3(x) \cdot \cos^3(x)$ (ii) $\ln\left(x + \sqrt{x^2+1}\right)$	[1+1.5+2.5]
2.	Sketch the graph of the following functions: *(CLO1, C3)* (i) $y = \lvert x-3 \rvert + 2$ (ii) $y = \sqrt{x+3}$ (iii) $y = (x+2)^2$	[02+02+02]
3.	Check the continuity of the function $f(x)$ at $x = 0$ and $x = \frac{\pi}{2}$: *(CLO1, C3)* $f(x) = \begin{cases} 1, & -\infty < x < 0 \\ 1+\sin x, & 0 \le x \le \frac{\pi}{2} \\ 2+\left(x-\frac{\pi}{2}\right)^2, & \frac{\pi}{2} < x < \infty \end{cases}$	[04]
4.	Demonstrate the following problems (any two): *(CLO2, C2)* (i) If $y = \ln\left(x + \sqrt{x^2+a^2}\right)$, then show that $y' = \frac{1}{\sqrt{x^2+a^2}}$ (ii) If $y = \ln(\sec x + \tan x)$, then show that $y' = \sec x$ (iii) If $y = x^n$, then find y_n (n-th derivative of y)	[02+02]
5.	Demonstrate the following problems: *(CLO2, C2)* (i) If $f(x) = \frac{x^3}{3} + ax^2 - 3a^2x$, then find the maximum and minimum values of $f(x)$. (ii) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$ by applying Euler's Theorem on Homogeneous Function.	[03+03]