



Daffodil International University

Faculty of Science & Information Technology

Department of Computing and Information System

Final Examination, Summer-2026

Course Code: MAT101, Course Title: Mathematics I

Level: 1 Term: 2

Exam Duration: 2 Hours

Marks: 40

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 proper and improper fractions with examples.	[2]	CO2
	b)	Express the following fractions as partial fractions: i) $\frac{7x-13}{(x-3)(x+1)}$ ii) $\frac{2x^2+x+1}{x^2+2x-3}$	[2] [4]	
2.	a)	Calculate the derivative of the following functions: i) $y = -2 \sec x + 3e^{-2x} + 5$ ii) $y = (\sin x)^{\cos x}$	[1] [3]	CO3
	b)	A garden is to be laid out in a rectangular area and protected by a wire fence. Only 200 running feet of wire is available for the fence. i) Derive the area function of the rectangular garden and calculate critical points. ii) Determine the height and width of the garden such that the area of the garden is maximum.	[3] [3]	
3.	a)	Calculate the following integrals: i) $\int_1^2 2x^2(x^3 + 2x^2 - 3)dx$ ii) $\int x \tan^{-1}(x) dx$	[3] [4]	CO4
	b)	Calculate the area of the circle $4x^2 + 4y^2 = 36$ using integration.	[5]	
4.	a)	i) Define the divergence of a vector field. ii) If $\phi(x, y, z) = 4x^2y^2 - 3yz^3$, calculate $\vec{\nabla}\phi$ at the point $(1, -2, 1)$.	[1] [5]	CO4
	b)	i) Define the dot product and the cross product. ii) Compute the value of a such that $\vec{A} = 2\hat{i} + a\hat{j} - 3\hat{k}$ and $\vec{B} = \hat{i} - 2\hat{j} - 3\hat{k}$ are perpendicular.	[2] [2]	