



Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Final Examination, Spring 2026

Course Code: MAT101, Course Title: Mathematics I

Sections & Teachers: 46(A-Q) & HSA, DK, AHB, RAR, MSIM

Time: 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.	Briefly explain the following terms a. Condition for a maximum point of a function. b. Conditions for critical point(s) and inflection point(s).	1+1=2	CLO-1 L-2
2.	a. Compute the extremum value(s), by mentioning all the critical points of the polynomial function: $y = x^5 - 4x^4 + 4x^3$ b. Imagine you are writing a script to monitor a server's network usage. During an update, the download speed fluctuates according to the function $f(t) = 3 + 2t^2$ (in MB/s), where t is the time in seconds. Interpret this rate function using a definite integral to find the exact total data (in Megabytes) downloaded during the first 15 seconds.	6+2=8 5	
3.	Evaluate the following Integrals by applying appropriate Integration techniques: a. $\int \frac{\tan^{-1} x}{1+x^2} dx$ b. $\int x^2 \sin x dx$ c. $\int_0^{\frac{\pi}{2}} \cos^4 x \sin^8 x dx$ d. $\int_1^2 \int_{x^2}^{2x} (4y - 2x) dy dx$	3+3+4+5=15	CLO-2 L-3
4.	a. Assume you are programming a 2D space simulation. A planet is centered at the origin (0, 0), and a satellite's elliptical orbit is defined by the equation $\frac{x^2}{9} + \frac{y^2}{4} = 1$. To define the simulation's rendering bounds, the engine must calculate the enclosed space. Using integration, compute the exact area bounded by this orbit. b. Calculate the area of the enclosed by the curve $y = x^2$ and the x -axis evaluating the limit from $x = -3$ to $x = 3$ with proper justification.	6 4	CLO-3 L-4