



# Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Summer 2025

Course Code: MAT101

Course Title: Mathematics I

Batch: 44; Section: A-L

Teachers Initial: MMH, DMMK, MIA, GRS

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 following with a suitable example a. Relation b. Bijective Function c. Homogeneous Function	3×1=3	
2.	<p>(a) Compute the domain and range of the following function</p> $f(x) = \frac{2x^2 + 3x + 17}{x^2 - x - 2}$ <p>(b) Express the following function graphically and write a comment on its domain and range from the graph</p> $f(x) =  x - 2  -  x + 3  +  x $	3 4	CLO-1 L-2
3.	<p>(a) Calculate the non-zero value of <math>k</math> that makes the following function continuous at <math>x = 0</math>, then also determine whether the function is differentiable or not at the same point by using the non-zero value of <math>k</math></p> $f(x) = \begin{cases} \frac{\tan kx}{x}, & x < 0 \\ 3x + k^2, & x \geq 0 \end{cases}$ <p>b. If <math>u = \tan^{-1} \left( \frac{y+x}{\sqrt{y}+\sqrt{x}} \right)</math> then show that <math>x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{4} \sin 2u</math></p> <p>c. Compute the derivative of <math>x^{\sin(\ln(\tan^{-1} \sqrt{ax}))}</math> with respect to <math>a^{bx} \sin^m(rx) + a^m</math></p> <p>d. If <math>y = \ln(a^n x + b^n)</math> then calculate the <math>n</math>-th derivative (<math>y_n</math>) of <math>y</math></p>	5 4 3 3	CLO-2 L-3