



# Daffodil International University

Faculty of Science & Information Technology

Department of Software Engineering

Midterm Examination, Fall 2026

Course Code: MAT101; Course Title: Mathematics I

Batch: 48; Section: A-O; Teachers Initial: MMH, ZT, MSIM, NDP, MMK

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. | <p>Explain the followings:</p> <p>a. Bijective Function, it's condition with a suitable example.</p> <p>b. Geometrical meaning of differentiation.</p> <p>c. The concept of limits for a real-valued function <math>f(x)</math>.</p>                                                                                                                                                                                                                   | 1<br>1<br>1         |              |
| 2. | <p>a. Compute the domain and range of the following function</p> $g(x) = \frac{2x + 1}{5x + 6}$ <p>b. Express the following function graphically, and comment about the region which can't be the range from the graph.</p> $f(x) = \begin{cases} x^2 - 1 & ; x < 0 \\ x & ; 0 \leq x < 1 \\ \frac{2}{x} & ; x \geq 1 \end{cases}$ <p>c. Express the following absolute value function into a piecewise function</p> $f(x) =  x - 1  +  2x + 1  +  x $ | 2<br><br>3<br><br>2 | CLO-1<br>L-2 |
| 3. | <p>a. Compute the continuity of the following function at <math>x = \frac{\pi}{2}</math>,</p> $f(x) = \begin{cases} 1 + \sin x & ; x < \frac{\pi}{2} \\ 2 + \left(x - \frac{\pi}{2}\right)^2 & ; x \geq \frac{\pi}{2} \end{cases}$ <p>b. Compute <math>\frac{dy}{dx}</math> for <math>(\cos x)^y = (\sin y)^x</math></p> <p>c. Compute <math>\frac{dy}{dx}</math> for <math>y = x^x + (\sin x)^{\ln \sqrt{x}}</math></p>                               | 3<br>3<br>3         | CLO-2<br>L-3 |

|                                                                                                                           |   |
|---------------------------------------------------------------------------------------------------------------------------|---|
| d. Compute the derivative of $x^{\ln \sqrt{a^{\cos^{-1} x}}} + a^{2x}$ with respect to $\cot^{-1} \frac{x}{\sqrt{1-x^2}}$ | 3 |
| e. If $y = (ax + b)^n$ then calculate $y_n$ , $y_s$ , and $y_p$ where, $s < n$ and $p > n$ .                              | 3 |