

Q.P Code: D132763	Total Pages: 2	Name
		Register No.
<b>FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025</b>		
<b>(CUFYUGP)</b>		
<b>MAT1MN103-BASIC CALCULUS</b>		
<b>2024 Admissions</b>		
<b>Maximum Time :2 Hours</b>		<b>Maximum Marks :70</b>

## Section A

**All Question can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)**

1	Find the domain and range of the function $f(x) = \frac{\sec \pi t}{4}$ .
2	Solve $\arctan(2x - 3) = \frac{\pi}{4}x$
3	Discuss the Continuity of the function $\frac{1}{x-1}$
4	Using definition of Tangent Line, find the slope of the graph $f(x) = 2x + 3$ at $x = 2$
5	Find $a$ such that $f$ is differentiable everywhere.  $f(x) = \begin{cases} ax^3 & \text{if } x \leq 2 \\ x^2 + 2 & \text{if } x > 2 \end{cases}$
6	Find the Critical Numbers of $f(x) = x^2 \ln(x^2 + 1)$
7	Find the relative extrema of $\sin x + \cos x$ in the interval $[0, \pi]$
8	Find the particular solution of $F'(x) = 2 \sin x$ , given that $F(0) = 1$
9	Define the term Definite Integral using Riemann Sum
10	Determine the open intervals on which the graph of $y = x^2 - x - 2$ is concave upward or concave downward.

## Section B

**All Question can be answered. Each Question carries 6 marks (Ceiling : 36 Marks))**

11	Determine whether the function $f(x) =  x - 3 $ ; $x \leq 3$ is one-to-one. If it is, find its inverse function.
12	Using $\epsilon - \delta$ definition, find $\lim_{x \rightarrow 2} (3x + 4)$
13	Explain why the function $f(x) = x^3 + x^2 + x + 2$ , has a zero in the interval $[0, 3]$ .
14	Find the derivative of $x^3 \sqrt{2 + \sin x^2}$
15	If $f(x) = -2x^2 + 4x + 3$ , then find the open intervals on which the function is increasing or decreasing and apply the First Derivative Test to identify all relative extrema
16	Verify Mean Value Theorem for the function $f(x) = (x+3) \ln(x+3)$ on the interval $[-2, -1]$
17	Evaluate the definite integral $\int_0^4 x^2 + 2 \, dx$ with Riemann Sum
18	Find the area of the region bounded by the graphs of the equations. $y = x^3 + x$ , $x = 2$ , $y = 0$

## Section C

**Answer any ONE. Each Question carries 10 marks**

19	Using Squeeze Theorem, show that $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 1$
20	<p>The velocity (in feet per second) of a particle moving along a line is</p> $v(t) = t^3 - 10t^2 + 29t - 20$ <p>where <math>t</math> is the time in seconds.</p> <ol style="list-style-type: none"> <li>What is the displacement of the particle on the time interval <math>1 \leq t \leq 5</math>?</li> <li>What is the total distance traveled by the particle on the time interval <math>1 \leq t \leq 5</math>?</li> </ol>