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D1BMT2504

Name: .....

Reg. No.: .....

FIRST SEMESTER B.Sc. FYUGP EXAMINATION, NOVEMBER 2025

(Regular/Improvement/Supplementary)

MATHEMATICS

MAJOR

MAT1CJ101: DIFFERENTIAL CALCULUS

Time: 2 Hours **Maximum Marks: 70**

M: Mark BL: Bloom's Taxonomy Level (1 to 6) CO: Course Outcome

Section A: Answer all questions. Each carries 3 marks.
Ceiling: 24 Marks

No.	Question	M	BL	CO
1.	Describe the region given by the inequality $(x-1)^2+y^2 \leq 4$.	3	1	CO1
2.	If $f(x)=\sqrt{x}$ and $g(x)=\sqrt{1-x}$, find the domain of $f(x)+g(x)$.	3	2	CO1
3.	When do you say that a function f is continuous at an interior point $x=c$?	3	2	CO1
4.	Show that if $\lim_{x\to c}\|f(x)\|=0$, then $\lim_{x\to c} f(x)=0$	3	3	CO1
5.	Find $\frac{dy}{dx}$ if $y^2=x$.	3	3	CO1
6.	Find the slope of the circle $x^2+y^2=25$ at the point $(3,-4)$.	3	4	CO1
7.	State Mean Value Theorem.	3	1	CO2
8.	Write the second derivative test for concavity.	3	2	CO3
9.	Define horizontal asymptote and vertical asymptote.	3	1	CO3
10.	Find $\lim_{x\to-\infty}\frac{\pi\sqrt{3}}{x^2}$ and $lim_{x\to}(\pi-\frac{2}{x^2})$.	3	3	CO3

Section B: Answer all questions. Each carries 6 marks.
Ceiling: 36 Marks

No.	Question	M	BL	CO
11.	Find the center and radius of the circle $x^2+y^2-8x+4y+16=0$.	6	3	CO1
12.	Evaluate $\lim_{h\to0^-}\frac{\sqrt{6}-\sqrt{5h^2+11h+6}}{h}$.	6	5	CO1
13.	Using the definition calculate the derivative of the function $f(x)=2x+3$.	6	3	CO1
14.	Using the definition calculate the derivative of the function $f(x)=\frac{1}{x}$.	6	3	CO1
15.	Find the points where the curve $y=x^4-2x^2+2$ has horizontal tangents.	6	4	CO1
16.	State and prove the first derivative test for increasing and decreasing functions.	6	5	CO2
17.	Let $f'(x)=\frac{4}{3}x^{-2/3}(x-1)$. a) What are the critical points of f? b) On what intervals is f increasing or decreasing? c) At what points, if any, does f assume local extreme values?	6	6	CO2

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18.	Find the asymptotes of the graph of $y = \frac{-8}{x^2-4}$.	6	5	CO3

Section C: Answer any one question. Each carries 10 marks. (1 x 10 = 10 Marks)

No.	Question	M	BL	CO
19.	State and prove Mean Value Theorem. Determine whether the function $f(x) = x^{4/5}$ satisfies the hypotheses of Mean Value Theorem on [0,1].	10	6	CO2
20.	Graph the function $y = x^4 - 4x^3 + 10$.	10	6	CO3