

Reg. No.:



W7901

Name:

University of Kerala

First Semester FYUGP Degree Examination, December 2025

Discipline Specific Core Course

MATHEMATICS

UK1DSCMAT108 - Differential Calculus

Academic Level: 100-199

2025-Admission

Time: 1 Hour 30 Minutes(90 Mins.)

Max. Marks: 42

**Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark
Each.Answer all questions**

Qn No.	Question	CL	CO
1	$\int \frac{1}{u} du =$ Options : A)0 B)1 C) $\ln u + C$ D)u	RE	4
2	Define the derivative of a function f at a point a.	RE	1
3	Find $\frac{d}{dx} \sin x^2$	UN	1
4	State product rule of differentiation.	UN	3
5	Give an example of a function that is continuous but not differentiable.	UN	1
6	Find $\lim_{x \rightarrow 0} \frac{\sin x}{x}$.	UN	1

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Find ds/dt if $s = (1+t)^{\sqrt{t}}$.	UN	2
8	Find the limit $\lim_{x \rightarrow +\infty} x e^{-x}$.	UN	1
9	Find $\frac{dy}{dx}$ if $y = (4x^2 - 1)(7x^3 + x)$	AP	2

Qn No.	Question	CL	CO
10	solve $(e^x - e^{-x})/2 = 1$ for x .	AP	2

Part C. 28 Marks. Time: 60 Minutes (Cognitive Level: Apply (AP)/Analyse (AN)/Evaluate (EV)/Create (CR)) Long Answer. 7 marks each. Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) Find 1. $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{\sin x} \right)$. 2. $\lim_{x \rightarrow 0} (1 + \sin x)^{\frac{1}{x}}$ OR B) Find the slopes of the tangent lines to the curve $y^2 - x + 1 = 0$ at the points (2,-1) and (2,1).	AP	3, 3
12	A) At which points in the first quadrant does the tangent line to the Folium of Descartes $x^3 + y^3 = 3xy$ become horizontal? OR B) Find the limits: a) $\lim_{x \rightarrow 0^+} x^{\sin x}$ b) $\lim_{x \rightarrow 0^+} (e^{2x} - 1)^x$	AN	3, 1
13	A) (a) Using logarithmic differentiation find the derivative of $\ln x$ (b) find the derivative of $\ln \sin x$ OR B) (a) Use implicit differentiation to find $\frac{dy}{dx}$ for the Folium of Descartes $x^3 + y^3 = 3xy$ (b) Find an equation of the tangent line to the Folium of Descartes at the points $(3/2, 3/2)$ (c) At what point(s) in the first quadrant is the tangent line to the Folium of Descartes horizontal	EV	3, 3
14	A) 1. Prove that $f(x) = x$ is not differentiable at $x = 0$. Also find a formula for $f'(x)$.	CR	3, 2

Qn No.	Question	CL	CO
	2. Find the area of the triangle formed from the coordinate axes and the tangent line to the curve $y = 5x^{-1} - \frac{1}{5}x$ at the point $(5, 0)$. OR B) (a) Compute the derivative of the function. $\ln(\cos^2 x)$ (b) Evaluate $\lim_{x \rightarrow 0} (1 + \sin x)^{\frac{1}{x}}$		