

First Semester FYUGP Degree (Reg/Sup) Examination**November 2025****KU1DSCMAT101 - CALCULUS I**

2024 Admission onwards

Time : 2 hours

Maximum Marks : 70

Section A**Answer any 6 questions. Each carry 3 marks.**

1. Find simpler expressions for the following quantities : $2 \ln(\sqrt{e})$.
2. Find the inverse of $y = x^2, x \geq 0$.
3. Compute $\int_{-\frac{\pi}{4}}^0 \tan x \sec^2 x \, dx$.
4. Write the formula for arc length of a curve $y = f(x)$.
5. Using integration, find the area between x -axis and the curve $y = \cos x$ from $x = 0$ to $x = \pi$.
6. Find the derivative of $y = \frac{\cos x}{1 - \sin x}$.
7. Using quotient rule, find the derivative of $y = \frac{t^2 - 1}{t^3 + 1}$ w.r.t. t .
8. Find $\frac{d}{dx}(3^x)$.

Section B**Answer any 4 questions. Each carry 6 marks.**

9. Evaluate $\int_0^{\pi/4} \tan x \, dx$ using substitution.
10. Evaluate $\int_0^{\pi} \frac{\sin t}{2 - \cos t} \, dt$.
11. Show that the area of the region enclosed by the hyperbola $xy = 1$, x -axis and the two ordinates $x = 1$, $x = 2$ is $\log 2$.
12. Find an equation for a line that is tangent to the graph of $y = e^x$ and goes through the origin.
13. Find the slopes of the curve $3y^2 - 2x + 30 = 0$ at the points $(21, 2)$ and $(21, -2)$.
14. Given the equation $x^3 + xy - 2x = 1$. Find $\frac{dy}{dx}$ by differentiating implicitly.

Section C

Answer any 2 questions. Each carry 14 marks.

15. Use partial fractions to evaluate $\int \frac{1}{x(x^2+1)^2} dx$.
16. (a) Using partial fractions, evaluate $\int \frac{6x+7}{(x+2)^2} dx$.
(b) Using trigonometric substitution, evaluate $\int \frac{dx}{\sqrt{16+x^2}}$.
17. (a) Find the inverse of the function $y = x^2$, $x \geq 0$, expressed as a function of x .
(b) State Algebraic properties of the Natural Logarithm.
(c) Simplify $3 \ln \sqrt[3]{t^2 - 1} - \ln(t + 1)$.