

First Semester FYUGP Degree (Reg/Sup) Examination

November 2025

KU1DSCMAT113 - FUNCTIONS, CALCULUS AND MATRICES

2024 Admission onwards

Time : 2 hours

Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Find the transpose of

$$\begin{bmatrix} 1 & 5 & 6 & 3 \\ 2 & 5 & 7 & 8 \\ 5 & 9 & 2 & 4 \end{bmatrix}$$

2. Write an example for
- 3×3
- skew-symmetric matrix.

3. Differentiate
- $\sin(x^2 + e^x)$
- with respect to
- x
- .

4. Find
- $\frac{dy}{dx}$
- if
- $y = \ln 2x$
- .

5. For any number
- a
- , find the derivative of
- $\ln ax$
- .

6. Use the laws of exponents to simplify the following expressions:

(a) $\frac{3^{\frac{1}{3}}}{3^{\frac{2}{3}}}$

(b) $\left(\frac{\sqrt{6}}{3}\right)^2$

7. Use the laws of exponents to simplify the following expressions:

(a) $9^{\frac{1}{3}} \cdot 9^{\frac{1}{6}}$

(b) $(25^{\frac{1}{8}})^4$

8. Define
- $\cosh x$
- and
- $\sinh x$
- , in terms of exponential functions.

Section B

Answer any 4 questions. Each carry 6 marks.

9. Find the derivatives of all orders of the function
- $y = (x - 1)(x^2 + 3x - 5)$
- .

10. Find an equation for a line that is tangent to the graph of
- $y = e^x$
- and goes through the origin.

11. Using logarithmic differentiation, find $\frac{dy}{dx}$ where $y = (\sin x)^{\cos x} > 0$.

12. Express the following logarithms in terms of $\ln 5$ and $\ln 7$.

(a) $\ln(1/125)$ (b) $\ln(9.8)$ (c) $\ln(7\sqrt{7})$.

13. Evaluate $\lim_{x \rightarrow 1} \sin^{-1} \left(\frac{1-x}{1-x^2} \right)$.

14. Simplify: $\ln(\cosh x + \sinh x) + \ln(\cosh x - \sinh x)$.

Section C

Answer any 2 questions. Each carry 14 marks.

15. (a) Evaluate $\int \frac{(x+1)(x+\log x)^2}{2x} dx$.

(b) Evaluate $\int \sin^3 x \, dx$.

16. (a) Evaluate $\int \sec x \, dx$.

(b) Evaluate $\int \sqrt{e^x - 1} \, dx$.

17. Find B such that $AB = \begin{bmatrix} 3 & 4 & 2 \\ 1 & 6 & 1 \\ 5 & 6 & 4 \end{bmatrix}$, where $A = \begin{bmatrix} 3 & 2 & 2 \\ 1 & 3 & 1 \\ 5 & 3 & 4 \end{bmatrix}$.