D5BEC2302

Reg. No..............................

Name: ....

FIFTH SEMESTER BA DEGREE EXAMINATION, NOVEMBER 2025
(Regular/Improvement/Supplementary)
ECONOMICS
GECO5B08T: MATHEMATICS FOR ECONOMICS

Time: 2 ½ Hours   **Maximum Marks: 80**

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 25 marks)

1. Define constants, parameters, and variables in the context of a mathematical function.

2. What is an inverse function? Explain how to determine if a function has an inverse.

3. Given the linear equation $y = \frac{3}{4}x - 5$, determine the slope and interpret its meaning.

4. Define a diagonal matrix. Give an example.

5. Multiply the matrix A= $\begin{bmatrix} 6 & 1 \\ 4 & 3 \end{bmatrix}$ by the scalar 4. Explain the effect of scalar multiplication on the matrix elements.

6. Find the rank of the matrix: $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 3 & 6 \end{bmatrix}$.

7. Differentiate the following implicit function with respect to x ; $x^2+y^2=25$.

8. Find the derivative of the logarithmic function $f(x)=\ln (x^2+1)$.

9. Determine whether the function $f(x) = \frac{2x+1}{x-1}$ is continuous at x=1.

10. Write down the conditions of convexity and concavity of functions.

11. Determine whether the function $f(x,y) = x^2 + y^2 + xy$ is homogeneous. If it is, find its degree.

12. Compute the Jacobian determinant of the transformation $F(x,y) = (x^2 - y^2, 2xy)$ at the point $(1,1)$.

13. For the function $Z = f(x,y) = e^{xy}$ Find the second order partial derivative of the function Z with respect to y.

14. State and prove the power rule for integration.

15. Evaluate the indefinite integral $\int (3x^2 - 4x + 1)dx$.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 35 marks)

16. Compare and contrast quadratic and cubic functions with suitable examples. Explain how their respective graphs differ in terms of shape

17. If $A = \begin{bmatrix} 2 & 0 & 3 \\ 4 & 1 & 5 \end{bmatrix}$, and $B = \begin{bmatrix} 1 & 3 \\ 3 & 0 \\ 2 & 4 \end{bmatrix}$, Show that matrix multiplication is not generally commutative.

18. Show that the determinant of a matrix product AB the product of the determinants of the individual matrices,

19. Determine the concavity and points of inflection of the function $y = x^4 - 4x^3 + 6x^2$.

20. Find the Hessian determinant of the function $Z = f(x, y) = x^3 + 3xy + y^3$ when $x = 1, y = 1$

21. A company's profit is given by $\pi = 100x - x^3$, where x is the number of units sold. Find the number of units that should be sold to maximize the profit.

22. Compute the definite integral $\int_0^2 (2x^3 - 3x^2 + 4)dx$

23. Calculate the consumer surplus when the demand function is $P = 80 - 4Q$ and the market price is $P = 20$

SECTION C: Answer any *two* questions. Each carries *ten* marks.

24. Define the adjoint of a matrix. Compute the adjoint of $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, Find the inverse of matrix G using its adjoint and determinant, and verify the result by showing that GG-1=I, where I is the identity matrix.

25. Calculate the first and second-order partial derivatives $\frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial y^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$ for $f(x, y) = e^x y + x^2 y$

26. Use the method of Lagrange multipliers to find the maximum value of $f(x, y) = xy$ subject to the constraint $x^2 + y^2 = 16$

27. What are derivatives? What are its uses in economics? Explain in detail with suitable examples.

(2 × 10 = 20 Marks)