Reg. No. : ....

Name : ....

Second Semester B.A. Degree Examination, September 2022

First Degree Programme under CBCSS

Mathematics

Complementary Course for Economics

MM 1231.5 : MATHEMATICS FOR ECONOMICS – II

(2021 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

(**All** the first **10** questions are compulsory. They carry **1** mark each)

1. If $y = 5e^x$ then find $\dfrac{dy}{dx}$.

2. Find the derivative of $y = x^2 + 5$.

3. Determine $\dfrac{dy}{dx}$ if $y = \sqrt{6}$.

4. Find $\dfrac{dy}{dx}$ if $y = x^{\frac{1}{2}}$.

5. What is the geometrical significance of the derivative of a function?

6. If $y = 100 + 8x + x^2$, find $\dfrac{dy}{dx}$.

7. Define a convex curve.

8. Write the conditions for maximum value at x_0 for a function $y = f(x)$.

9. Find the second order derivative of x^7.

10. State quotient rule of differentiation.

(**10 × 1 = 10 Marks**)

P.T.O.

SECTION – B

(Answer **any eight** questions from among the questions **11 to 26**. These questions carry **2 marks each**.)

11. Find $\dfrac{dy}{dx}$ if $y = 3x^8 - 2x^5 + 6x + 1$.

12. Find $\dfrac{dy}{dx}$, if $y = (1+x)\sqrt{x}$.

13. Find the second derivative of $y = e^{4x}$.

14. Find $\dfrac{dy}{dx}$ when $xy = 1$.

15. If $y = \sqrt{4x+3}$, find $\dfrac{dy}{dx}$.

16. Find $\dfrac{dy}{dx}$ if $y = 3x^4 - 2x^3 + 6x + 1$.

17. Find the derivative of $y = \sqrt{4 - x^2}$.

18. Find the stationary points of $y = x^2 - 4x + 10$.

19. Show that $y = \dfrac{1}{x}$ is a decreasing function.

20. Find $\dfrac{dy}{dx}$ when $xy + x^2 = 4$.

21. If $2x + 3y = 5$ find $\dfrac{dy}{dx}$ at $x = 1$.

22. Find $\dfrac{dy}{dx}$ where $y = x^5(2x^3 + 1)$.

23. Examine the curve $y = x^3$ for convexity.

24. Examine the parabola $y = x^2$ for upward concavity.

25. Find $\dfrac{dy}{dx}$ at $x = 1$ if $y = x^2 + 1$.

26. Use implicit differentiation to find $\dfrac{dy}{dx}$ when $x^2 - y^3 = xy$.

(8 × 2 = 16 Marks)

P – 1223

SECTION – C

(Answer **any six** questions from among the questions 27 to 38. These questions carry **4** marks.)

27. Differentiate the following with respect to x :

$$y = \frac{x^3}{x^2 + 1}.$$

28. Is the curve $y = \frac{x-1}{x+1}$ monotonically increasing?

29. Examine the curve $y = 2x^4 - x$ for convexity.

30. Find $\frac{dy}{dx}$ when $x^2 y = 3$.

31. Show that $y = x^3 + 3x + 1$ satisfies $\frac{d^3 y}{dx^3} + x \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} = 0$.

32. If $y = x^4 - 4x^3 + 6x^2 - 4x + 10$, show that $\frac{dy}{dx} = 4(x-1)^3$.

33. If $y = \frac{4x^2 + x}{2x^3 + 1}$, find $\frac{dy}{dx}$.

34. Find the maximum and minimum values of the function $y = x^4 - 4x^3 + 4x^2$.

35. Write all derivatives of $y = 2x^3 - 6x^2 + 9x$.

36. Examine the curve $y = x^3 - 3x^2 - 9x + 6$ for convexity.

37. Find the derivative of $y = \frac{x+2}{x^2 - 3}$ and find its value of $x = 0$.

38. Find the fourth derivative of $y = 3x^4 - 2x^3 + x^2 - 4x + 2$.

(6 × 4 = 24 Marks)

(Answer **any two** questions from among the questions 39 to 44. These questions carry **15** marks each)

39. (a) If $y = \sqrt{\dfrac{1+x}{1-x}}$, find $\dfrac{dy}{dx}$.

    (b) If $y = (x^2 + 3)(2x^2 + 7)^3$, find $\dfrac{dy}{dx}$.

40. (a) If $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$, show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}$.

    (b) If $x^2 y + 3xy^3 - x = 3$, find $\dfrac{dy}{dx}$.

41. (a) Find the maximum and minimum value of $y = \dfrac{1 - x + x^2}{1 + x + x^2}$.

    (b) Find the maximum profit that a company can make, if the profit function is given by $y = 41 - 24x - 18x^2$.

42. (a) Show that $y = \dfrac{1-x}{1+x}$ is monotonically decreasing.

    (b) Find the least value of 'a' such that the function $x^2 + ax + 1$ is increasing on (1, 2).

43. (a) Find $\dfrac{dy}{dx}$ if $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.

    (b) Find $\dfrac{dy}{dx}$ if $x^3 + y^3 = 3axy$.

44. (a) If $y = \sqrt{2 - x^2}$, find the second order derivative of y.

    (b) If $y = x^3 - 9x^2 + 9x$, find all derivatives at $x = 2$.

(2 × 15 = 30 Marks)

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