



(Pages : 4)

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Reg. No. : .....

Name : .....

**First Semester B.A. Degree Examination, February 2018**

**First Degree Programme under CBCSS**

**COMPLEMENTARY COURSE I FOR ECONOMICS**

**MM 1131.5 : Mathematics for Economics – I**

**(2013 Admission onwards)**

Time : 3 Hours

Max. Marks : 80

**SECTION – I**

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

1. Write the general form of a polynomial function.

2. If  $f(x) = 3x + 1$  and  $g(x) = 2x - 5$ , find  $f + g$ .

3. Define equilibrium quantity.

4.  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = \underline{\hspace{2cm}}$

5. Write an example of a discontinuous function.

6. Write the derivative of  $\log x$ .

7. State product rule of differentiation.

8. Find  $\frac{d}{dx} (x^3 + x^2 + x + 1)$ .

9. What is the geometrical meaning of derivative of a function at a point.

10. If total cost is  $TC = 5x^2 + 15$ , what is the marginal cost function MC ?



## SECTION - II

Answer any 8 questions from among the questions 11 to 22. These questions carry 2 marks each.

11. Find the natural domain of  $\sqrt{9 - x^2}$ .
12. Graph the function  $y = 5x + 4$ .
13. If the linear demand function  $Q = -\frac{1}{3}P + 235$ , find the total revenue function for the producer.
14. If total cost function  $TC = 2Q^2 + 3Q + 52$  and total revenue function  $TR = -Q^2 + 55Q$ , find the marginal cost and marginal revenue.
15. Show that the marginal revenue can be expressed as  $p + x \frac{dp}{dx}$ .
16. Discuss the continuity of  $\frac{x+1}{x-2}$ .
17. Find the derivative of  $y = \frac{x^2+1}{x^3}$ .
18. Find the critical points of  $f(x) = 3x^3 - 27x^2 + 45x + 28$ .
19. Find  $\frac{dy}{dx}$  where  $x = \cos t$  and  $y = \sin t$ .
20. Find  $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$ .
21. If  $x$  and  $y$  satisfy the equation  $x^2 + y^2 = 1$ , prove that  $\frac{dy}{dx} = -\frac{x}{y}$ .
22. Differentiate  $y = x \cdot \log(x^2 + 1)$ .



## SECTION - III

Answer any 6 questions from among the questions 23 to 31. These questions carry 4 marks each.

23. Find the value of  $k$  so that  $f(x) = \begin{cases} x^2, & \text{if } x \geq 3 \\ k - x, & \text{if } x < 3 \end{cases}$  is continuous.
24. Plot the curve  $2y = x^2$ .
25. Given  $f(x) = x^4$ ,  $g(x) = x^2 - 3x + 4$  and  $h(x) = \frac{x}{x-5}$ , find  $f(g(x))$ ,  $f(h(x))$ ,  $g(f(x))$  and  $g(h(x))$ .
26. Solve  $7x^2 - 32x + 16$ .
27. Find equilibrium price and equilibrium quantity given supply :  $Q = \frac{2}{3}P + 150$  and demand :  $Q = -\frac{1}{3}P + 450$ , using (a) equations (b) graphs.
28. If total cost and total revenue functions are  $TC = Q^3 - 1.5Q^2 + 50Q + 425$  and  $TR = 3200Q - 9Q^2$ , find maximum profit.
29. If  $f(x) = 3 + \frac{1}{1 - \frac{1}{1+x}}$ ,  $0 < x < 1$ , find  $\lim_{x \rightarrow -1} f(x)$ .
30. Examine the function  $y = \frac{|x|}{1+x}$  from the point of view of continuity and illustrate it graphically.
31. Find  $f^{(1)}(x)$ ,  $f^{(2)}(x)$ ,  $f^{(3)}(x)$  and  $f^{(4)}(x)$ , where  $f(x) = x^4 - 5x^3 + 11x + 3$ .



## SECTION - IV

Answer any 2 questions from among the questions 32 to 35. These questions carry 15 marks each.

32. a) If  $f(x) = x^5$  and  $g(x) = x^2$ , find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .

b) Is  $(f \circ g)(x) = (g \circ f)(x)$  always? Justify.

c) Find  $f(3)$ , where  $f(x) = \frac{x^2 - 3x + 4}{x^2 + 5x + 9}$ .

33. Find the inverse function of  $y = \frac{2x - 1}{x + 1}$  and show that it is single-valued.

Represent it graphically and explain the behavior in the neighbourhood of  $x = -1$  and  $y = 2$ .

34. Given that total revenue  $R(x) = 280x - 2x^2$  and total cost  $C(x) = 60x + 5600$

a) Express profit as a function of  $x$

b) Determine maximum level of profit.

c) Sketch the graph of profit function.

35. Differentiate the following :

a)  $\frac{\sin x \cdot \cos x}{x}$

b)  $\sqrt{\frac{3+x}{2-x}}$

c)  $x^2 + y^2 + 2x + 4y + 5 = 0$ .