



**MAR IVANIOS COLLEGE (AUTONOMOUS)**  
**THIRUVANANTHAPURAM**

Reg. No. :.....

Name :.....

**First Semester B.A. Degree Examination, November 2014**

**First Degree Programme under CBCSS**

**Complementary Course: Mathematics – I (for Economics)**

**AUMM131.1a: Mathematics for Economics**

Time: 3 Hours

Max. Marks: 80

**SECTION – A**

*Answer ALL questions / problems in one or two sentences.*

1. Define a bijective function.
2. Evaluate  $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x^2 - 1}$ .
3. When do we say that a function  $y = f(x)$  is continuous at a point  $x = x_0$ .
4. Define product rule for differentiation.
5. Find the derivative of  $\frac{x^3 + 2x - 7}{x + 5}$ .
6. Find  $\frac{dy}{dx}$  if  $y = e^{x^2}$ .
7. Find  $\frac{dy}{dx}$  if  $x = at^2, y = 2at$ .
8. Find the differential coefficient of  $y = \log(x^2 + 1)$ .
9. If the total revenue is  $5q^2 - 3q + 3$ , find the average revenue at  $q = 3$  units.
10. If the total cost is  $5x^2 + 2x - 1$ , find the marginal cost when  $x = 3$ .

**(10 x 1 = 10 Marks)**

P.T.O.

## SECTION – B

Answer any **EIGHT** questions / problems, not exceeding a paragraph.

11. Find the domain and range of the function  $(x) = \frac{x^3}{x-2}$ .
12. Evaluate  $\lim_{x \rightarrow -2} \frac{x^2 - 4}{x + 2}$ .
13. Find  $\lim_{x \rightarrow 0} \frac{e^{3x} - 1}{x}$ .
14. Find the points of discontinuity of the function  $f(x) = \frac{x}{x^2 - 2}$ .
15. Draw the graph of the function  $y = 2x + 5$ .
16. Differentiate with respect to  $x$ ,  $\frac{(x^2 - 4)^2}{\log x}$ .
17. Find  $\frac{dy}{dx}$ , if  $ax^2 + 2hxy + by^2 = 0$ .
18. If  $xy = 1$ , show that  $\frac{dy}{dx} + y^2 = 0$ .
19. Find the elasticity of demand  $\eta$  of the function  $x = 50 - 2p$ , at  $p = 3$ .
20. If the demand function is given by  $q = 36 - 2p$ , find the marginal revenue for  $x = 4$  units.
21. Find the slope of the tangent to the curve  $y = 2x^2 - 6x + 2$  at the point  $x = 2$ .
22. At what level of output will average cost be minimum ?

(8 x 2 = 16 Marks)

## SECTION – C

Short essay type problems : Answer any **SIX** questions.

23. Find  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$ .
24. Evaluate  $\lim_{x \rightarrow 0} \frac{e^{3x} - 1}{x}$ .

25. Draw the graph of the function  $y = 3x^2 - 5$ .

26. Examine the continuity of the function  $f(x) = \begin{cases} \frac{x^2 - x - 2}{x - 2}; & x \neq 2 \\ 3 & ; x = 2 \end{cases}$ .

27. If the function  $f$  given below is continuous at  $x = 1$ , find the value of  $k$ .

$$f(x) = \begin{cases} \frac{x^2 - 3x + 2}{x - 1}; & x \neq 1 \\ k & ; x = 1 \end{cases}$$

28. Find  $\frac{dy}{dx}$  if  $y = x^x + (\log x)^x$ .

29. Differentiate  $x^x$  with respect to  $x \log x$ .

30. A firm produces an output of  $x$  tons of a certain product at a total variable cost given by  $\Pi = ax^3 + bx^2 + cx$ . Show that the average cost is a parabola.

31. Find the price elasticity of demand and marginal revenue when price is Rs.3/-, if the demand function is  $q = 15 - p - p^2$ .

(6 x 4 = 24 Marks)

### SECTION – D

*Long essay type problems: Answer any TWO questions.*

32. (i). If  $f(x) = x^2 - 2x + 3$ , show that  $f(x+1) + f(x-1) = 2(1 + f(x))$ .

(ii). For the demand function  $p = \frac{4}{x+6}$ , what happens to demand as price changes.

(iii). Show that  $f(x) = \begin{cases} \frac{|x-a|}{x-a} & ; x \neq a \\ 1 & ; x = a \end{cases}$  is discontinuous at  $x = a$ .

33. (i). Examine the function  $y = \frac{1-x}{1+x}$  from the point of view of continuity and illustrate graphically.

(ii). If  $x = \frac{3at}{1+t^2}$  and  $y = \frac{3at^2}{1+t^2}$ , find  $\frac{dy}{dx}$ .

(iii). Find  $\frac{dy}{dx}$  if  $y = x^{x^x}$ .

34. (i). Find the point on the curve  $y = x^2 - 4x + 2$  where the tangent to it is parallel to the x – axis.

(ii). If  $x^m y^n = (x + y)^{m+n}$ , then prove that  $\frac{dy}{dx} = y x^{-1}$ .

(iii). Find the elasticity of supply when price is Rs.7/-, for the supply function:  
 $x = -4p + p^2$ .

35. (i). Find the marginal cost of a commodity if the total cost is given by  
 $5x^2 + 2x - 1$ , when  $x = 3$ .

(ii). Find the average revenue and marginal revenue if the total revenue is given  
 by:  $-q^2 + 7q - 10$ , when  $q = 7$ .

(iii). Find the elasticity of demand with respect to price if the demand curve is  
 given by :  $q = \frac{4}{p^2 - 1}$ , when the price is Rs.5/-

**(2 x 15 = 30 Marks)**

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