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Name:

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(Regular/Supplementary/Improvement)

(CUCBCSS-UG)

CC15UMAT1C01- MATHEMATICS

(Mathematics - Complementary Course)

(2015 Admission Onwards)

Time: Three Hours

Maximum: 80 Marks

I Answer *all* questions

1. State the quotient rule of differentiation.
2. Find the derivative of
3. =
4. =
5. A point of discontinuity of the function is
6. Define Critical points of a function.
7. State intermediate value property of derivatives.
8. Functions with same derivatives differ by a -----
9. Where does the function $y = \sec x$ have vertical asymptotes?
10. The interval on which the function decreases is
11. =
12. =

(12 x 1 = 12 Marks)

II Answer *any nine* questions

13. If , for , find .
14. Check differentiability of the function .
15. Applying L' Hospital's rule find .
16. Find the linearization of at .

17. Find the critical points of
18. If , find $\delta > 0$ such that
 $0 < \implies < \epsilon$.
19. Define corner and cusp with examples.

20. Find the value of c that satisfies the mean value theorem for the function $f(x) = x^2 - 2x + 1$ on $[0, 1]$.

21. Find the asymptotes of the graph of $f(x) = \frac{x^2 - 4}{x - 2}$.

22. Show that if f is continuous, then f is differentiable.

23. State the first form of fundamental theorem of calculus.

24. Evaluate $\int_1^e \frac{1}{x} dx$.

(9 x 2 = 18 Marks)

III Answer **any six** questions

25. Find the continuous extension to $x = 1$ of the function $f(x) = \frac{x^2 - 1}{x - 1}$.

26. Show that $f(x) = \frac{x^2 - 1}{x - 1}$ is continuous at $x = 1$.

27. The volume of a fluid flowing through a small pipe in a unit of time at a fixed pressure is a constant time the fourth power of pipes' radius. How will a increase in affect ?

28. Discuss the behavior of $f(x) = \frac{1}{x}$ near $x = 0$.

29. Prove that $\lim_{x \rightarrow 0} \frac{1}{x} = \infty$.

30. Find the first and second derivative of $f(x) = x^3 - 3x^2 + 2x - 1$.

31. Verify mean value theorem for the function $f(x) = \ln x$ on the interval $[1, e]$

32. Define average value of an integrable function over a closed interval. Find the average value of $f(x) = 1$ on $[0, 1]$.

33. Evaluate $\int_0^1 x^2 dx$ using Riemann definition

(6 x 5 = 30 Marks)

IV Answer **any two** questions

34. Graph the function $f(x) = x^2 - 2x + 1$.

35. Use the formal definitions to prove that

(i) $\lim_{x \rightarrow 0} \frac{1}{x} = \infty$

(ii) $\lim_{x \rightarrow 0} \frac{1}{x^2} = \infty$

36. (i) Show that the line $y = x$ is its own tangent at any point.

(ii) Find the slope of the curve $y = x^2$ at $x = 1$. Where does the slope equal 2?

(2 x 10 = 20 Marks)
