

22U510

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Name:

Reg. No:

FIFTH SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(CBCSS-UG)

(Regular/Supplementary/Improvement)

CC20U MTS5 D01 – APPLIED CALCULUS

(Mathematics – Open Course)

(2020 Admission onwards)

Time: 2 Hours

Maximum: 60 Marks

Credit: 3

Section A

Answer *all* questions Each question carries 2 marks.

1. Find the domain and range of the function $f(x) = \sqrt{4-x^2}$
2. Does the curve $y = x^4 - 2x^2 + 2$ has any horizontal tangents? If so, where?
3. Write an equation for the line which passes through the point $(-1,2)$ with slope $\frac{2}{3}$
4. Evaluate $\lim_{x \rightarrow 1} \frac{1-\sqrt{x}}{1-x}$
5. Define marginal cost of production
6. The slope of the curve $y = \frac{x}{x-1}$ at $x=0$ is
7. A function f is continuous at an interior point $x = c$ of its domain, if $\lim_{x \rightarrow c} f(x) = \dots\dots\dots$
8. Find the derivative of $y = (x^2 + 1)(x^2 + 2)$
9. Define critical points of a function.
10. Find the points of inflexion of the curve $y = 3x^4 - 4x^3 + 1$
11. Simplify a) $8^{\frac{2}{3}} + 16^{\frac{3}{4}}$ b) $4^{-3} \times 16^2$
12. If $\log_2 x = 5$, what is $\ln x$?

(Ceiling: 20 Marks)

Section B

Answer *all* questions. Each question carries 5 marks.

13. Find the equation of tangent to the curve $y = x^3 - 4x + 1$ at $(2,1)$
14. Determine the intervals on which the function $f(x) = -x^3 + 12x + 5$ is increasing or decreasing
15. Find whether the function $f(x) = \begin{cases} x^2 + 1, & \text{if } x \leq 3 \\ 2x + 4, & \text{if } x > 3 \end{cases}$ is continuous at $x = 3$.

16. It is estimated that x months from now, the population of a certain community will be

$$P(x) = x^2 + 20x + 8,000$$

a) At what rate will the population be changing with respect to time 15 months from now?

b) By how much will the population actually change during the 16th month?

17. Find the derivative of $y = \frac{1}{(x^2 - 1)(x^2 + x + 1)}$

18. How long will it take Rs.5000 to grow to Rs.7,000 in an investment earning interest at an annual rate of 6%, if the compounding is Quarterly.

19. Solve for x : $\ln(x+3) - \ln x = 5 \ln(x^2 - 4)$

(Ceiling: 30 Marks)

Section C

Answer any *one* question. The question carries 10 marks.

20. Graph the function $y = x^4 - 4x^3 + 10$

21. Evaluate

a) $\int x^5 e^{1-x^6} dx$

b) $\lim_{x \rightarrow \infty} \frac{3x^2 + 2x - 3}{5x^2 + 2}$

(1 × 10 = 10 Marks)
