CUET (UG) – MATHEMATICS

Chapter Test - Section B2: Applied Mathematics - Unit III: Calculus

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

1. If the cost function is given by $C(x) = 100 + 5x + 0.01x^2$, the marginal cost when 50 units are produced is:
   (A) 5
   (B) 6
   (C) 10
   (D) 106

2. The function $f(x) = x^2 - 4x + 5$ is strictly increasing in the interval:
   (A) $(-\infty, 2)$
   (B) $(-\infty, 4)$
   (C) $(2, \infty)$
   (D) $(0, \infty)$

3. If $y = e^{2x} + \sin(x)$, then the second order derivative d^2y/dx^2 is:
   (A) $4e^{2x} - \sin(x)$
   (B) $2e^{2x} - \cos(x)$
   (C) $4e^{2x} + \cos(x)$
   (D) $e^{2x} - \sin(x)$

4. The revenue function is $R(x) = 20x - x^2$. The value of x for which the revenue is maximum is:
   (A) 20
   (B) 5
   (C) 10
   (D) 0

5. The value of the definite integral $\int_1^2 (3x^2 + 2x)dx$ is:
   (A) 10
   (B) 12
   (C) 8
   (D) 7

6. Given the demand function $p = 50 - 2x$, the consumer surplus at $x = 10$ is:
   (A) 100
   (B) 200
   (C) 50
   (D) 150

7. The solution of the differential equation $dy/dx = 0.05y$ with $y(0) = 1000$ represents:
   (A) Linear growth
   (B) Exponential decay
   (C) Exponential growth
   (D) Constant function

8. If the marginal revenue is $MR = 15 - 2x$, then the total revenue function $R(x)$ (assuming $R(0) = 0$) is:
   (A) $15x - x^2$
   (B) $15 - x^2$
   (C) $15x - 2x^2$
   (D) $30x - x^2$

9. The function $f(x) = x^3 - 3x^2 + 10$ has a local minimum at:
   (A) $x = 0$
   (B) $x = 1$

(C) $x = 2$
(D) $x = 3$

10. The supply function for a commodity is $p = 2x + 5$. The producer surplus at $x = 5$ is:
(A) 25
(B) 50
(C) 15
(D) 10

11. The order and degree of the differential equation $(d^2y/dx^2)^3 + (dy/dx)^2 + y = 0$ are respectively:
(A) 2, 2
(B) 3, 2
(C) 2, 3
(D) 1, 3

12. For a particular product, the price elasticity of demand is given by $\eta = -(p/x)(dx/dp)$. If $x = 100/p^2$, then the elasticity is:
(A) 1
(B) 2
(C) 0.5
(D) 3

13. The integral $\int e^{2x+3}dx$ is equal to:
(A) $2e^{2x+3} + C$
(B) $\frac{1}{2}e^{2x+3} + C$
(C) $e^{2x+3} + C$
(D) $\frac{1}{3}e^{2x+3} + C$

14. If a population grows at a rate proportional to its size, $dP/dt = kP$, and it doubles in 10 years, the value of k is:
(A) $\log(2)/10$
(B) $10/\log(2)$
(C) $2/10$
(D) $10/2$

15. The area bounded by the curve $y = x^2$, the x-axis, and the lines $x = 1$ and $x = 3$ is:
(A) 26/3
(B) 27/3
(C) 9
(D) 8

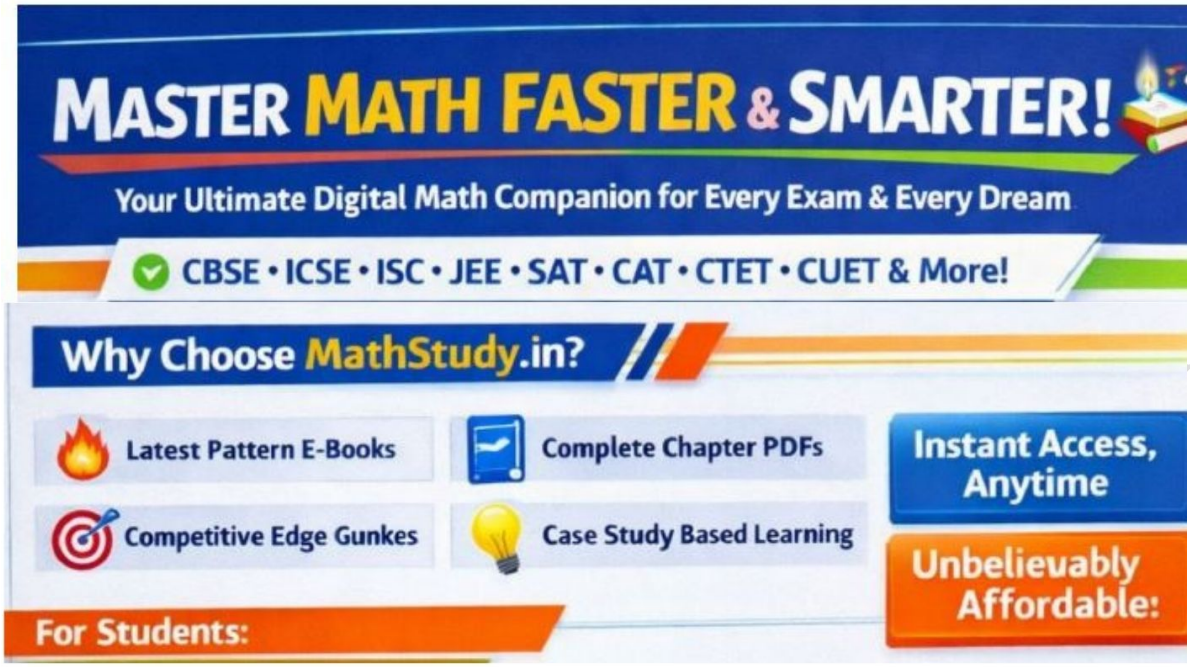
16. The marginal cost of a product is $MC = 4 + 0.6x$. If the fixed cost is 100, the total cost $C(x)$ is:
(A) $4x + 0.3x^2$
(B) $4x + 0.6x^2 + 100$
(C) $4x + 0.3x^2 + 100$
(D) $4x + 0.6x + 100$

17. Which of the following functions is always decreasing for all real x?
(A) $f(x) = e^x$
(B) $f(x) = x^3$
(C) $f(x) = 10 - 2x$
(D) $f(x) = \sin(x)$

18. If $f(x) = \int_0^x (t^2 - 5t + 6)dt$, then $f(x)$ has critical points at:
    (A) 0, 5
    (B) 2, 3
    (C) 1, 6
    (D) 0, 6

19. The value of $\int_0^1 \frac{1}{1+x} dx$ is:
    (A) $\log(1)$
    (B) $\log(2)$
    (C) 1
    (D) 0.5

20. In a model of radioactive decay, the mass M after time t is $M = M_0 e^{-0.1t}$. The time taken for the mass to reduce to half its initial value is:
    (A) $0.1 \log(2)$
    (B) $10 \log(2)$
    (C) $\log(2)$
    (D) $5 \log(2)$



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