CUET (UG) – MATHEMATICS

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

SOLUTIONS

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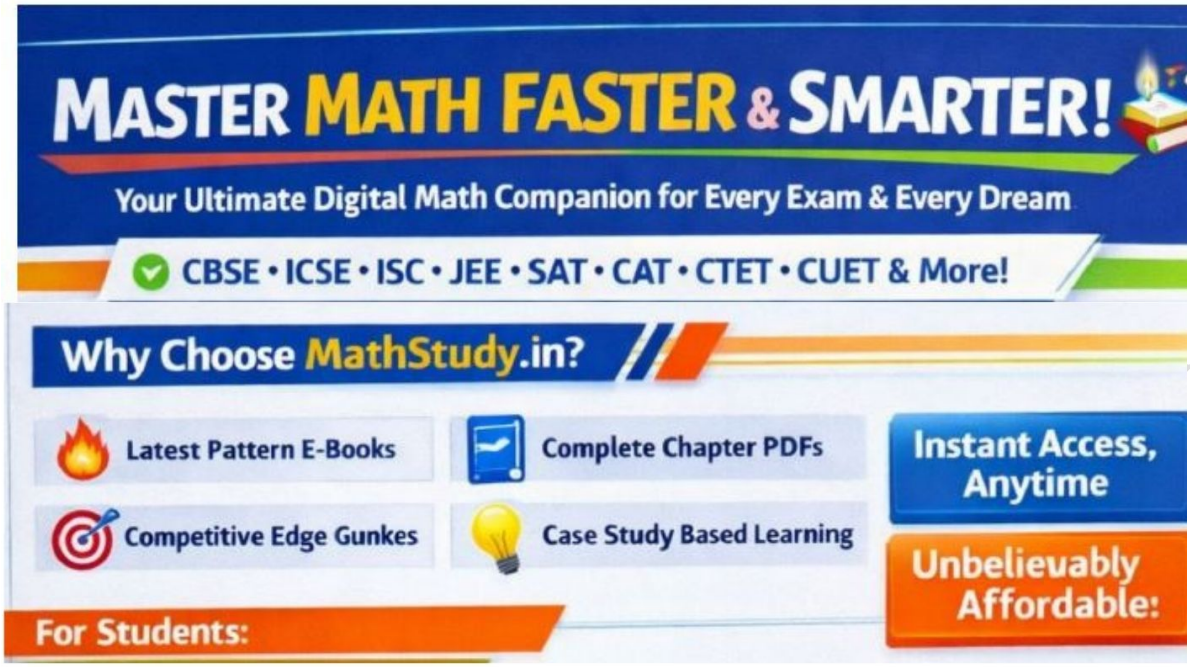

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Solutions

1. **Correct Option: (B)**. Marginal Cost $MC = C'(x) = 5 + 0.02x$. For $x = 50$, $MC = 5 + 0.02(50) = 5 + 1 = 6$.

2. **Correct Option: (C)**. $f'(x) = 2x - 4$. Strictly increasing when $2x - 4 > 0 \implies x > 2$.

3. **Correct Option: (A)**. $y' = 2e^{2x} + \cos x$. $y'' = 4e^{2x} - \sin x$.

4. **Correct Option: (C)**. $R'(x) = 20 - 2x = 0 \implies x = 10$. $R''(x) = -2$ (Maximum).

5. **Correct Option: (A)**. $\int_1^2 (3x^2 + 2x)dx = [x^3 + x^2]_1^2 = (8 + 4) - (1 + 1) = 10$.

6. **Correct Option: (A)**. p_0 at $x = 10$ is $50 - 20 = 30$. $CS = \int_0^{10}(50 - 2x)dx - (30 \times 10) = [50x - x^2]_0^{10} - 300 = 400 - 300 = 100$.

7. **Correct Option: (C)**. The positive coefficient 0.05 in $y' = ky$ indicates exponential growth.

8. **Correct Option: (A)**. $R(x) = \int (15 - 2x)dx = 15x - x^2 + C$. Since $R(0) = 0, C = 0$.

9. **Correct Option: (C)**. $f'(x) = 3x^2 - 6x = 0 \implies x = 0, 2$. $f''(x) = 6x - 6$. $f''(2) = 6 > 0$ (Min).

10. **Correct Option: (A)**. p_0 at $x = 5$ is 15. $PS = (15 \times 5) - \int_0^5 (2x + 5)dx = 75 - [x^2 + 5x]_0^5 = 75 - 50 = 25$.

11. **Correct Option: (C)**. Order is the highest derivative (2). Degree is the power of that derivative (3).

12. **Correct Option: (B)**. $x = 100p^{-2} \implies dx/dp = -200p^{-3}$. $\eta = -(p/x)(dx/dp) = -(p/(100p^{-2}))(-200p^{-3}) = 2$.

13. **Correct Option: (B)**. Integral of e^{ax+b} is $\frac{1}{a}e^{ax+b}$. Here $a = 2$.

14. **Correct Option: (A)**. $2 = e^{10k} \implies \ln 2 = 10k \implies k = \ln 2/10$.

15. **Correct Option: (A)**. $\int_1^3 x^2 dx = [x^3/3]_1^3 = 9 - 1/3 = 26/3$.

16. **Correct Option: (C)**. $C(x) = \int (4 + 0.6x)dx + FC = 4x + 0.3x^2 + 100$.

17. **Correct Option: (C)**. $f'(x) = -2$. Since the derivative is always negative, the function always decreases.

18. **Correct Option: (B)**. $f'(x) = x^2 - 5x + 6 = 0 \implies (x - 2)(x - 3) = 0 \implies x = 2, 3$.

19. **Correct Option: (B)**. $\int_0^1 \frac{1}{1+x}dx = [\ln(1 + x)]_0^1 = \ln 2 - \ln 1 = \ln 2$.

20. **Correct Option: (B)**. $0.5 = e^{-0.1t} \implies \ln(0.5) = -0.1t \implies -\ln 2 = -0.1t \implies t = 10 \ln 2$.