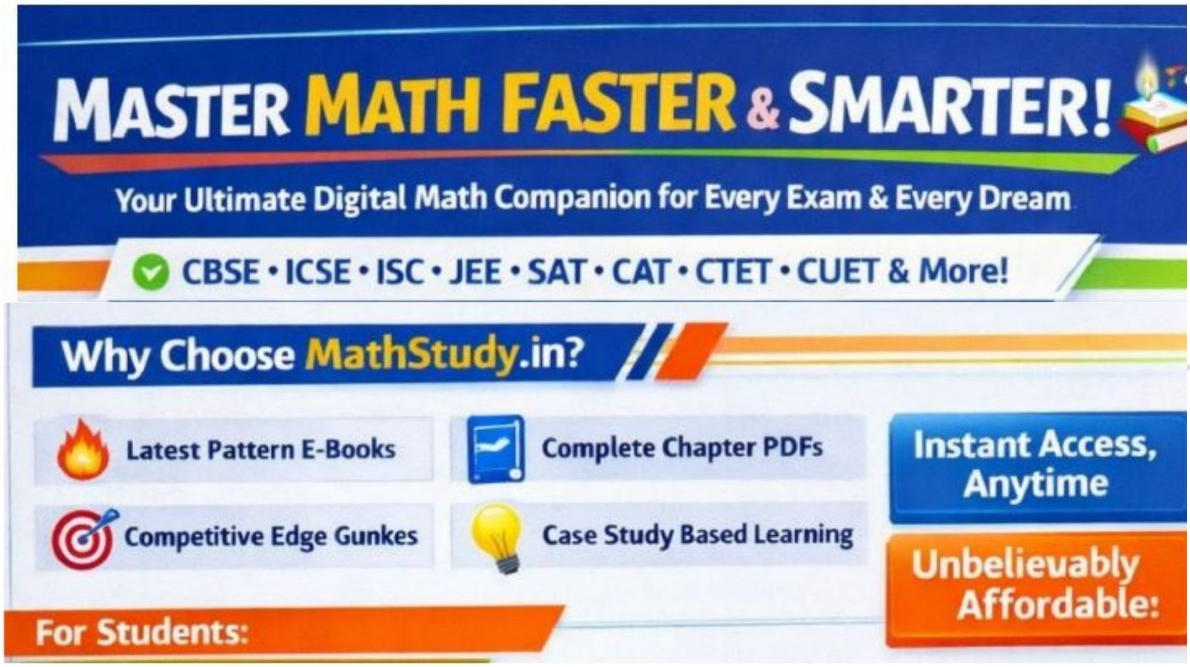
Unit III: Calculus - Applications of Integrals

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Read each question carefully before answering.
5. Choose the most appropriate answer from the given options.
6. Use of calculator or electronic devices is strictly prohibited.

1. Find the area of the region bounded by the curves $y = \ln x$, $y = \ln|x|$, $y = |\ln x|$ and $y = |\ln|x||$ for $x \in [-e, e]$.
2. Calculate the area of the region $\{(x, y) : x^2 + y^2 \leq 1 \leq x + y\}$.
3. Find the area of the region bounded by the parabola $y^2 = 4x$ and the circle $4x^2 + 4y^2 = 9$.
4. Find the area of the region bounded by the curve $y = x^2$ and the line $y = |x|$.
5. Determine the area of the region $\{(x, y) : y^2 \leq 2x \text{ and } y \geq 4x - 1\}$.
6. Find the area of the region bounded by the curves $y = \sqrt{x}$, $2y - x + 3 = 0$, x-axis, and lying in the first quadrant.
7. Calculate the area of the region bounded by the curve $y = \cos x$ and $y = \sin x$ between $x = 0$ and $x = \pi/2$.
8. Find the area of the region $\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$.
9. Find the area of the region bounded by the parabola $y = x^2$ and the curve $y = |x|$.
10. Using integration, find the area of the triangle formed by the positive x-axis and the tangent and normal to the circle $x^2 + y^2 = 4$ at $(1, \sqrt{3})$.
11. Find the area of the region bounded by $y = |x - 1|$ and $y = 3 - |x|$.
12. Calculate the area of the region bounded by $y^2 = x, y = 4, x = 0$ and $x = 4$.
13. Find the area of the region bounded by the curve $y = x^3$, its tangent at $x = 1$ and the x-axis.
14. Determine the area of the region $\{(x, y) : y \geq \sqrt{|x + 3|}, 5y \leq x + 9\}$.
15. Find the area of the region bounded by the curves $y = e^x, y = e^{-x}$ and the line $x = 1$.
16. Calculate the area of the region bounded by the curve $y = x \sin x^2$, the x-axis and the ordinates $x = 0$ and $x = \sqrt{\pi/2}$.
17. Find the area of the region bounded by $x^2 + y^2 \leq 8x$ and $y^2 \geq 4x$.
18. Find the area of the region bounded by the ellipse $x^2 + 4y^2 = 4$ and the line $x + 2y = 2$.
19. Determine the area of the region $\{(x, y) : x^2 \leq y \leq |x|\}$.
20. Find the area bounded by the curve $y = \tan x$, the x-axis and the tangent to the curve at $x = \pi/4$.



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