CUET Mathematics Test

Chapter: Applications of Integrals

SOLUTIONS

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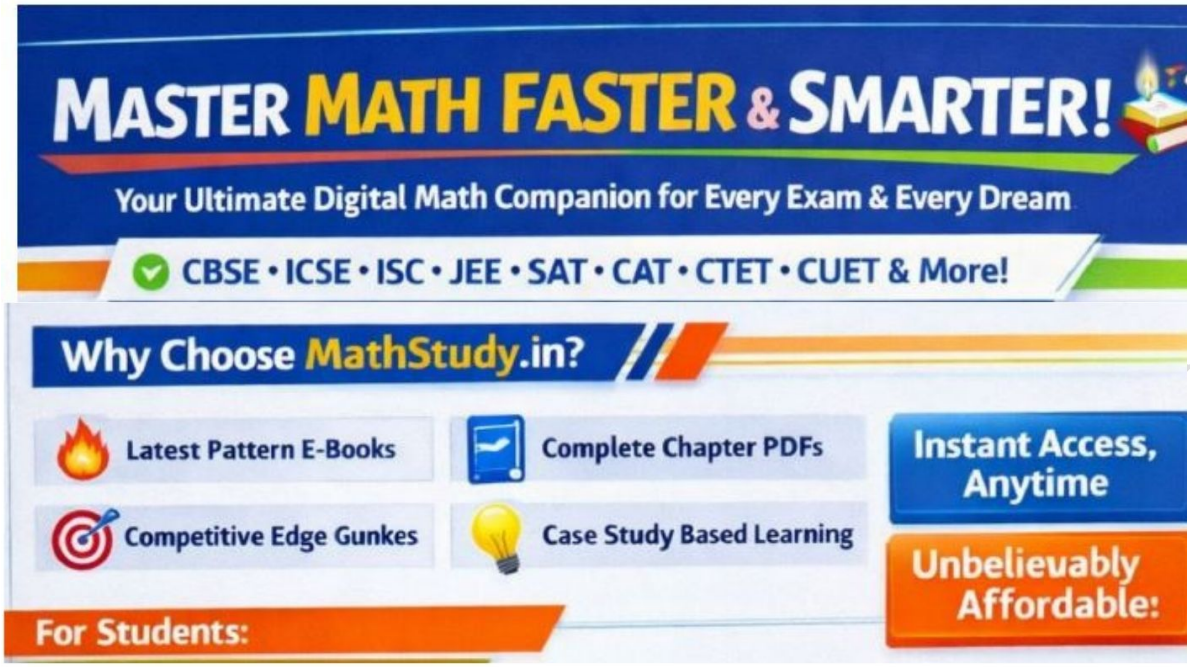

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Solutions

1. **Solution:** Area $= \int_2^3 x\,dy = \int_2^3 y^2\,dy = [\frac{y^3}{3}]_2^3 = \frac{27-8}{3} = 19/3$. **Correct Option: (A)**

2. **Solution:** Area $= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times \pi \times 16 = 4\pi$. **Correct Option: (C)**

3. **Solution:** Area of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab. Here $a = 2, b = 3$, Area $= \pi(2)(3) = 6\pi$. **Correct Option: (A)**

4. **Solution:** Area $= 2\int_0^3 \sqrt{4x}\,dx = 4\int_0^3 x^{1/2}\,dx = 4[\frac{2}{3}x^{3/2}]_0^3 = \frac{8}{3}(3\sqrt{3}) = 8\sqrt{3}$. **Correct Option: (B)**

5. **Solution:** Area $= \int_0^{\pi/2} \cos x\,dx + |\int_{\pi/2}^{\pi} \cos x\,dx| = [\sin x]_0^{\pi/2} + |[\sin x]_{\pi/2}^{\pi}| = 1 + |0 - 1| = 2$. **Correct Option: (C)**

6. **Solution:** Area $= 2\int_0^4 \sqrt{y}\,dy = 2[\frac{2}{3}y^{3/2}]_0^4 = \frac{4}{3}(8) = 32/3$. **Correct Option: (A)**

7. **Solution:** Area $= \int_{-2}^0 |x^3|\,dx + \int_0^1 x^3\,dx = [-\frac{x^4}{4}]_{-2}^0 + [\frac{x^4}{4}]_0^1 = 4 + 1/4 = 17/4$. **Correct Option: (C)**

8. **Solution:** Area is the sum of areas of two triangles: $\int_0^1 (1-x)dx + \int_1^2 (x-1)dx = 1/2 + 1/2 = 1$. **Correct Option: (A)**

9. **Solution:** Area $= 2\int_{a/\sqrt{2}}^a \sqrt{a^2 - x^2}\,dx = 2[\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}]_{a/\sqrt{2}}^a = \frac{a^2}{4}(\pi - 2)$. **Correct Option: (A)**

10. **Solution:** Area $= 2\int_0^2 2\sqrt{y}\,dy = 4[\frac{2}{3}y^{3/2}]_0^2 = \frac{8}{3}(2\sqrt{2}) = \frac{16\sqrt{2}}{3}$. **Correct Option: (A)**

11. **Solution:** Area $= \int_0^1 (\sqrt{x} - x^2)\,dx = [\frac{2}{3}x^{3/2} - \frac{x^3}{3}]_0^1 = 2/3 - 1/3 = 1/3$. **Correct Option: (C)**

12. **Solution:** Area $= \int_0^1 (\sqrt{x} - x)\,dx = [\frac{2}{3}x^{3/2} - \frac{x^2}{2}]_0^1 = 2/3 - 1/2 = 1/6$. **Correct Option: (A)**

13. **Solution:** The line crosses x-axis at $x = -2/3$. Area $= |\int_{-1}^{-2/3}(3x+2)dx| + \int_{-2/3}^1 (3x+2)dx = 1/6 + 25/6 = 26/6 = 13/3$. **Correct Option: (A)**

14. **Solution:** Area $= \int_1^2 2y^2\,dy = [\frac{2y^3}{3}]_1^2 = \frac{2(8-1)}{3} = 14/3$. **Correct Option: (A)**

15. **Solution:** Area = (Area of quadrant) - (Area of triangle) $= \frac{\pi(1)^2}{4} - \frac{1}{2}(1)(1) = \pi/4 - 1/2$. **Correct Option: (A)**

16. **Solution:** Area $= \int_0^{\log 2} e^x\,dx = [e^x]_0^{\log 2} = 2 - 1 = 1$. **Correct Option: (A)**

17. **Solution:** Curve intersects x-axis at $x = \pm 2$. Area $= \int_{-2}^2 (4 - x^2)\,dx = [4x - \frac{x^3}{3}]_{-2}^2 = (8 - 8/3) - (-8 + 8/3) = 16/3 + 16/3 = 32/3$. **Correct Option: (A)**

18. **Solution:** Area $= \int_0^{\pi/4} \sin 2x\,dx = [-\frac{\cos 2x}{2}]_0^{\pi/4} = -1/2(0 - 1) = 1/2$. **Correct Option: (A)**

19. **Solution:** Area $= \int_0^a \frac{b}{a}\sqrt{a^2 - x^2}\,dx - \frac{1}{2}ab = \frac{\pi ab}{4} - \frac{ab}{2} = \frac{ab}{4}(\pi - 2)$. **Correct Option: (A)**

20. **Solution:** Area $= \int_1^e \log x\,dx = [x\log x - x]_1^e = (e - e) - (0 - 1) = 1$. **Correct Option: (A)**

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