Area Under Curve

1. The area of the region bounded by the parabola $(y-2)^2 = x-1$, the tangent to the parabola at the point (2, 3) and the x-axis is **[AIEEE-2009]**

(1) 6 (2) 9

(3) 12 (4) 3

2. The area bounded by the curves $y = \cos x$ and $y = \sin x$ between the ordinates $x = 0$ and $x = \frac{3\pi}{2}$ is **[AIEEE-2010]**

(1) $4\sqrt{2}-2$ (2) $4\sqrt{2}+2$

(3) $4\sqrt{2}-1$ (4) $4\sqrt{2}+1$

3. The area bounded by the curves $y^2 = 4x$ and $x^2 = 4y$ is **[AIEEE-2011]**

(1) $\frac{8}{3}$ (2) 0

(3) $\frac{32}{3}$ (4) $\frac{16}{3}$

4. The area bounded between the parabolas $x^2 = \frac{y}{4}$ and $x^2 = 9y$, and the straight line $y = 2$ is **[AIEEE-2012]**

(1) $\frac{10\sqrt{2}}{3}$ (2) $\frac{20\sqrt{2}}{3}$

(3) $10\sqrt{2}$ (4) $20\sqrt{2}$

5. The area (in square units) bounded by the curves $y = \sqrt{x}, 2y - x + 3 = 0$, x-axis, and lying in the first quadrant is **[JEE (Main)-2013]**

(1) 9 (2) 36

(3) 18 (4) $\frac{27}{4}$

6. The integral $\int\left(1+x-\frac{1}{x}\right)e^{x+\frac{1}{x}}dx$ is equal to **[JEE (Main)-2014]**

(1) $(x+1)e^{x+\frac{1}{x}}+c$ (2) $-xe^{x+\frac{1}{x}}+c$

(3) $(x-1)e^{x+\frac{1}{x}}+c$ (4) $xe^{x+\frac{1}{x}}+c$

7. The area of the region described by $A = \{(x, y) : x^2 + y^2 \le 1 \text{ and } y^2 \le 1 - x\}$ is **[JEE (Main)-2014]**

(1) $\frac{\pi}{2}-\frac{2}{3}$ (2) $\frac{\pi}{2}+\frac{2}{3}$

(3) $\frac{\pi}{2}+\frac{4}{3}$ (4) $\frac{\pi}{2}-\frac{4}{3}$

8. The area (in sq. units) of the region described by $\{(x, y) : y^2 \le 2x \text{ and } y \ge 4x - 1\}$ is **[JEE (Main)-2015]**

(1) $\frac{7}{32}$ (2) $\frac{5}{64}$

(3) $\frac{15}{64}$ (4) $\frac{9}{32}$

9. The area (in sq. units) of the region $\{(x,y) : y^2 \ge 2x \text{ and } x^2 + y^2 \le 4x, x \ge 0, y \ge 0\}$ is **[JEE (Main)-2016]**

(1) $\pi-\frac{8}{3}$ (2) $\pi-\frac{4\sqrt{2}}{3}$

(3) $\frac{\pi}{2}-\frac{2\sqrt{2}}{3}$ (4) $\pi-\frac{4}{3}$

10. The area (in sq. units) of the region $\{(x, y) : x \ge 0, x + y \le 3, x^2 \le 4y \text{ and } y \le 1+\sqrt{x}\}$ is **[JEE (Main)-2017]**

(1) $\frac{3}{2}$ (2) $\frac{7}{3}$

(3) $\frac{5}{2}$ (4) $\frac{59}{12}$

11. Let $g(x)=\cos x^2, f(x)=\sqrt{x}$, and α, β ($\alpha < \beta$) be the roots of the quadratic equation $18x^2 - 9\pi x + \pi^2 = 0$. Then the area (in sq. units) bounded by the curve $y = (gof)(x)$ and the lines $x = \alpha$, $x = \beta$ and $y = 0$, is **[JEE (Main)-2018]**

(1) $\frac{1}{2}(\sqrt{3}-1)$ (2) $\frac{1}{2}(\sqrt{3}+1)$

(3) $\frac{1}{2}(\sqrt{3}-\sqrt{2})$ (4) $\frac{1}{2}(\sqrt{2}-1)$

12. The area (in sq. units) bounded by the parabola $y = x^2 - 1$, the tangent at the point (2, 3) to it and the y-axis is **[JEE (Main)-2019]**

(1) $\frac{32}{3}$ (2) $\frac{8}{3}$

(3) $\frac{56}{3}$ (4) $\frac{14}{3}$

13. The area of the region $A = \{(x, y) : 0 \le y \le x|x| + 1 \text{ and } -1 \le x \le 1\}$ in sq. units, is **[JEE (Main)-2019]**

(1) 2 (2) $\frac{4}{3}$

(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

14. If the area enclosed between the curves $y = kx^2$ and $x = ky^2$, ($k > 0$), is 1 square unit. Then k is **[JEE (Main)-2019]**

(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{2}{\sqrt{3}}$

15. The area (in sq. units) of the region bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is **[JEE (Main)-2019]**

(1) $\frac{7}{8}$ (2) $\frac{5}{4}$

(3) $\frac{9}{8}$ (4) $\frac{3}{4}$

16. The area (in sq. units) in the first quadrant bounded by the parabola, $y = x^2 + 1$, the tangent to it at the point (2, 5) and the coordinate axes is **[JEE (Main)-2019]**

(1) $\frac{187}{24}$ (2) $\frac{8}{3}$

(3) $\frac{14}{3}$ (4) $\frac{37}{24}$

17. The area (in sq. units) of the region bounded by the parabola, $y = x^2 + 2$ and the lines, $y = x + 1$, $x = 0$ and $x = 3$, is **[JEE (Main)-2019]**

(1) $\frac{15}{2}$ (2) $\frac{21}{2}$

(3) $\frac{15}{4}$ (4) $\frac{17}{4}$

18. The area (in sq. units) of the region $A = \{(x, y) \in R \times R | 0 \le x \le 3, 0 \le y \le 4, y \le x^2 + 3x\}$ is: **[JEE (Main)-2019]**

(1) $\frac{26}{3}$ (2) $\frac{59}{6}$

(3) 8 (4) $\frac{53}{6}$

19. Let $S(\alpha) = \{(x, y) : y^2 \le x, 0 \le x \le \alpha\}$ and $A(\alpha)$ is area of the region $S(\alpha)$. If for a λ, $0 < \lambda < 4$, $A(\lambda) : A(4) = 2 : 5$, then λ equals **[JEE (Main)-2019]**

(1) $2\left(\frac{2}{5}\right)^{\frac{1}{3}}$ (2) $2\left(\frac{4}{25}\right)^{\frac{1}{3}}$

(3) $4\left(\frac{2}{5}\right)^{\frac{1}{3}}$ (4) $4\left(\frac{4}{25}\right)^{\frac{1}{3}}$

20. The area (in sq. units) of the region $A = \{(x, y) : x^2 \le y \le x + 2\}$ is **[JEE (Main)-2019]**

(1) $\frac{31}{6}$ (2) $\frac{10}{3}$

(3) $\frac{9}{2}$ (4) $\frac{13}{6}$

21. The area (in sq. units) of the region $A = \left\{(x, y) : \frac{y^2}{2} \le x \le y + 4\right\}$ is **[JEE (Main)-2019]**

(1) 18 (2) 16

(3) $\frac{53}{3}$ (4) 30

22. The region represented by $|x-y| \le 2$ and $|x+y| \le 2$ is bounded by a **[JEE (Main)-2019]**

(1) Square of side length $2\sqrt{2}$ units

(2) Square of area 16 sq. units

(3) Rhombus of side length 2 units

(4) Rhombus of area $8\sqrt{2}$ sq. units

23. The area (in sq. units) of the region bounded by the curves $y = 2^x$ and $y = |x + 1|$, in the first quadrant is : **[JEE (Main)-2019]**

(1) $\frac{3}{2} - \frac{1}{\log_e 2}$ (2) $\frac{1}{2}$

(3) $\log_e 2 + \frac{3}{2}$ (4) $\frac{3}{2}$

24. If the area (in sq. units) of the region $\{(x, y) : y^2 \le 4x,\ x + y \le 1,\ x \ge 0,\ y \ge 0\}$ is $a\sqrt{2} + b$, then $a - b$ is equal to **[JEE (Main)-2019]**

(1) $-\frac{2}{3}$ (2) 6

(3) $\frac{10}{3}$ (4) $\frac{8}{3}$

25. If the area (in sq. units) bounded by the parabola $y^2 = 4\lambda x$ and the line $y = \lambda x$, $\lambda > 0$, is $\frac{1}{9}$, then λ is equal to **[JEE (Main)-2019]**

(1) 48 (2) 24

(3) $4\sqrt{3}$ (4) $2\sqrt{6}$

26. The area of the region, enclosed by the circle $x^2 + y^2 = 2$ which is not common to the region bounded by the parabola $y^2 = x$ and the straight line $y = x$, is **[JEE (Main)-2020]**

(1) $\frac{1}{6}(24\pi - 1)$ (2) $\frac{1}{6}(12\pi - 1)$

(3) $\frac{1}{3}(12\pi - 1)$ (4) $\frac{1}{3}(6\pi - 1)$

27. The area (in sq. units) of the region $\{(x, y) \in R^2 \mid 4x^2 \le y \le 8x + 12\}$ is **[JEE (Main)-2020]**

(1) $\frac{128}{3}$ (2) $\frac{125}{3}$

(3) $\frac{127}{3}$ (4) $\frac{124}{3}$

28. For $a > 0$, let the curves $C_1 : y^2 = ax$ and $C_2 : x^2 = ay$ intersect at origin O and a point P. Let the line $x = b (0 < b < a)$ intersect the chord OP and the x-axis at points Q and R, respectively. If the line $x = b$ bisects the area bounded by the curves, C_1 and C_2, and the area of $\Delta OQR = \frac{1}{2}$, then 'a' satisfies the equation **[JEE (Main)-2020]**

(1) $x^6 + 6x^3 - 4 = 0$ (2) $x^6 - 12x^3 - 4 = 0$

(3) $x^6 - 6x^3 + 4 = 0$ (4) $x^6 - 12x^3 + 4 = 0$

29. The area (in sq. units) of the region $\{(x, y) \in R^2 : x^2 \le y \le 3 - 2x\}$, is **[JEE (Main)-2020]**

(1) $\frac{31}{3}$ (2) $\frac{29}{3}$

(3) $\frac{34}{3}$ (4) $\frac{32}{3}$

30. Given : $f(x) = \begin{cases} x & , \ 0 \le x < \frac{1}{2} \\ \frac{1}{2} & , \ x = \frac{1}{2} \\ 1 - x & , \ \frac{1}{2} < x \le 1 \end{cases}$

and $g(x) = \left(x - \frac{1}{2}\right)^2, x \in R$. Then the area (in sq. units) of the region bounded by the curves, $y = f(x)$ and $y = g(x)$ between the lines, $2x = 1$ and $2x = \sqrt{3}$, is **[JEE (Main)-2020]**

(1) $\frac{\sqrt{3}}{4} - \frac{1}{3}$ (2) $\frac{1}{3} + \frac{\sqrt{3}}{4}$

(3) $\frac{1}{2} - \frac{\sqrt{3}}{4}$ (4) $\frac{1}{2} + \frac{\sqrt{3}}{4}$

31. Area (in sq. units) of the region outside $\frac{|x|}{2} + \frac{|y|}{3} = 1$ and inside the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is **[JEE (Main)-2020]**

(1) $3(4 - \pi)$ (2) $6(4 - \pi)$

(3) $6(\pi - 2)$ (4) $3(\pi - 2)$

32. Consider a region $R = \{(x, y) \in R^2 : x^2 \le y \le 2x\}$. if *a* line $y = \alpha$ divides the area of region *R* into two equal parts, then which of the following is true?

[JEE (Main)-2020]

(1) $3\alpha^2 - 8\alpha + 8 = 0$ (2) $\alpha^3 - 6\alpha^{3/2} - 16 = 0$

(3) $3\alpha^2 - 8\alpha^{3/2} + 8 = 0$ (4) $\alpha^3 - 6\alpha^2 + 16 = 0$

33. The area (in sq. units) of the region $\left\{(x, y) : 0 \le y \le x^2 + 1, 0 \le y \le x + 1, \frac{1}{2} \le x \le 2\right\}$ is

[JEE (Main)-2020]

(1) $\frac{79}{16}$ (2) $\frac{23}{6}$

(3) $\frac{79}{24}$ (4) $\frac{23}{16}$

34. The area (in sq. units) of the region $A = \{(x, y) : (x - 1)[x] \le y \le 2\sqrt{x},\ 0 \le x \le 2\}$, where [t] denotes the greatest integer function, is

[JEE (Main)-2020]

(1) $\frac{8}{3}\sqrt{2} - 1$ (2) $\frac{4}{3}\sqrt{2} + 1$

(3) $\frac{8}{3}\sqrt{2} - \frac{1}{2}$ (4) $\frac{4}{3}\sqrt{2} - \frac{1}{2}$

35. The area (in sq. units) of the region $A = \{(x, y) : |x| + |y| \le 1, 2y^2 \ge |x|\}$ is **[JEE (Main)-2020]**

(1) $\frac{1}{6}$ (2) $\frac{7}{6}$

(3) $\frac{5}{6}$ (4) $\frac{1}{3}$

36. The area (in sq. units) of the region enclosed by the curves $y = x^2 - 1$ and $y = 1 - x^2$ is equal to

[JEE (Main)-2020]

(1) $\frac{7}{2}$ (2) $\frac{4}{3}$

(3) $\frac{8}{3}$ (4) $\frac{16}{3}$

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