MATHS

BOOKS - KC SINHA ENGLISH

APPLICATIONS OF INTEGRALS - FOR COMPETITION

Solved Examples

1. Find the area of the region bounded by the x-axis and the curves defined by $y = \tan x \left(where - \frac{\pi}{2} \leq x \leq \frac{\pi}{3}\right)$ and $y = \cot x \left(where \frac{\pi}{6} \leq x \leq \frac{3x}{2}\right)$.

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2. Find the area bounded by the curves $x^2 + y^2 = 4, x^2 = \sqrt{2}y, and x = y$.

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3. Find the area bounded by the curves $x^2+y^2=25, 4y=|4-x^2|$, and $x=0$ above the x-axis.

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4. Find the area of the region bounded by the curve C : y=tan x ,tangent drawn to C at x=pi/4, and the x-axis.

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5. The area bounded by the curve $y=x(x-1)^2$, the y-axis and the line $y=2$ is

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6. The area between the curve $y = 2x^4 - x^2$, the axis, and the ordinates of the two minima of the curve is 11/60 sq. units (b) 7/120 sq. units 1/30 sq. units (d) 7/90 sq. units

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7. Compute the area of the region bounded by the curves $y = ex \log_e x$ and $y = \dfrac{\log x}{ex}$.

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8. The line $y = mx$ bisects the area enclosed by the curve $y = 1 + 4x - x^2$ and the lines $x = 0, x = \dfrac{3}{2}$ and $y = 0$. Then the value of m is

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9. Let $f(x) = Ma\xi\mu m\left\{x^2, (1-x)^2, 2x(1-x)\right\}$, where $0 \leq x \leq 1$. Determine the area of the region bounded by the curves $y = f(x), x - a\xi s, x = 0,$ and $x = 1$.

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10. A curve $y = f(x)$ passes through the origin. Through any point (x, y) on the curve, lines are drawn parallel to the coordinate axes. If the curve divides the area formed by these lines and coordinates axes in the ratio $m : n$, find the curve.

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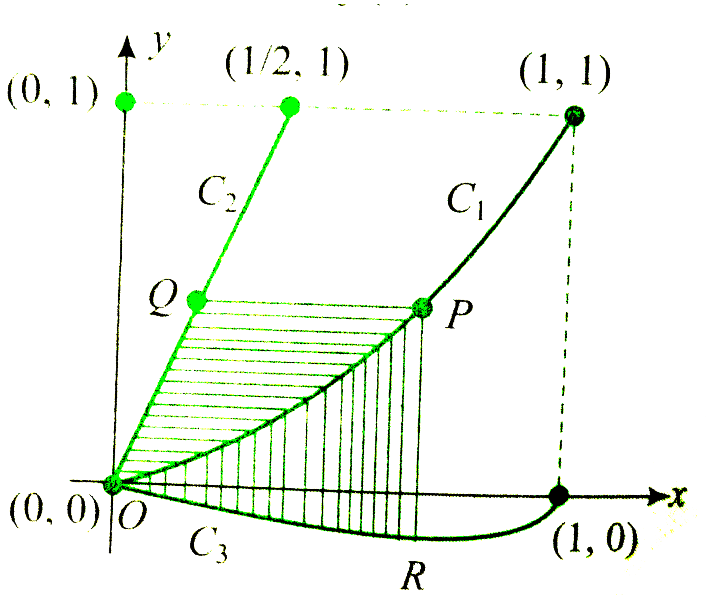
11. Let C_1 and C_2 be the graphs of the functions $y = x^2$ and $y = 2x$, respectively, where $0 \leq x \leq 1$. Let C_3 be the graph of a function y=f(x), where $0 \leq x \leq 1, f(0) = 0$. For a point P on C_1, let the lines through P, parallel to the axes, meet C_2 and C_3 at Q and R, respectively (see figure). If for every position of $P(onC_1)$, the areas of the shaded regions OPQ and ORP are equal, determine the function f(x).



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12. Find the ratio of the areas in which the curve $y = \left[\frac{x^3}{100} + \frac{x}{35}\right]$ divides the circle $x^2 + Y^2 - 4x + 2y + 1 = 0$. (where, [.] denotes the greated integer function).

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13. Find the area of the region formed by $x^2 + y^2 - 6x - 4y + 12 \leq 0$, $y \leq x$ and $2x \leq 5$.

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14. Find all the possible values of $b > 0$, so that the area of the bounded region enclosed between the parabolas $y = x - bx^2 andy = \frac{x^2}{b}$ is maximum.

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15. Consider a square with vertices at $(1, 1), (-1, 1), (-1, -1)$ and $(1, -1)$. Let S be the region consisting of all points inside the square which are nearer to the origin than to any edge. Sketch the region S and find its area.

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16. Let A_n be the area bounded by the curve $y = (\tan x)^n$ and the lines $x = 0, y = 0,$ and $x = \frac{\pi}{4}$. Prove that for $n > 2$, $A_n + A_{n-2} = \frac{1}{n-1}$ and deduce `1/(2n+2)

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17. Let $f(x)$ be continuous function given by $f(x) = \{2x, |x| \leq 1 \text{and } x^2 + ax + b, |x| > 1\}$.

Find the area of the region in the third quadrant bounded by the curves $x = -2y^2 and y = f(x)$ lying on the left of the line $8x + 1 = 0$.

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18. Sketch the region included between the curves $x^2 + y^2 = a^2$ and $\sqrt{|x|} + \sqrt{|y|} = \sqrt{a}(a.0)$ and find its area.

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19. 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

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20. Find the area of the region given by $x+y \leq 6$, $x^2+y^2 \leq 6y$ and $y^2 \leq 8x$.

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21. Let $b \neq 0$ and for $j = 0, 1, 2, \ldots, n$. Let S_j be the area of the region bounded by Y_axis and the curve $x \cdot e^{ay} = \sin by$, $\frac{j\pi}{b} \leq y \leq \frac{(j+1)\pi}{b}$. Show that $S_0, S_1, S_2, \ldots S_n$ are in geometric progression. Also, find their sum for a=-1 and $b = \pi$.

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22. Find the area bounded by the curve $x^2 = y, x^2 = -yandy^2 = 4x - 3$

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23. If [4a2 4a 1 4b2 4b 1 4c2 4c 1] [f-1 f1 f2] = [3a2 + 3a 3b2 + 3b 3c2 + 3c] fx is a quadratic function and its maximum value occurs at a point V. A is a point of intersection of y = f x with x-axis and point .B is such that chord AB subtends a right angled at V. Find the area enclosed by fx and chord AB.

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24. Find the area of the region bounded by the curves $y = x^2, y = |2 - x^2|,$ and $y = 2,$ which lies to the right of the line x=1.

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25. The area bounded by the parabolas $y=(x+1)^2$ and $y=(x-1)^2 andy=(x-1)^2$ and the line $y=\frac{1}{4}$ is 4 sq. units (b) 1/6 sq. units 4/3 sq. units (d) 1/3 sq. units

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26. The area of the region between the curves $y=\sqrt{\frac{1+\sin x}{\cos x}}$ and $y=\sqrt{\frac{1-\sin x}{\cos x}}$ and bounded by the lines $x=0$ and $x=\frac{\pi}{4}$ is

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27. Consider the function $f(x)=\begin{cases} x-[x]-\frac{1}{2} & x \notin \\ 0 & x \in I \end{cases}$ where [.] denotes the fractional integral function and I is the set of integers. Then find $g(x)\ \max.\ \left[x^2, f(x), |x|\right\}, \ -2 \leq x \leq 2.$

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28. Consider the function $f(x) = \begin{cases} x - [x] - \frac{1}{2} & x \notin \\ 0 & x \in I \end{cases}$ where [.] denotes the fractional integral function and I is the set of integers. Then find $g(x)\ \max .\ [x^2, f(x), |x|\}, \ -2 \leq x \leq 2.$

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Exercise

1. Show that the area between the curve $y = ce^{2x}$, the x-axis and any two ordinates is proportional to the difference between the ordinates, c being constant.

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2. Find the area of the region boounded by the curve $y = 2x - x^2$ and the X-axis.

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3. Find the area bounded by the curve $y = x^3 - 3x^2 + 2x$ and the x-axis.

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4. Find the area included between the parabola $y = \frac{x^2}{4a}$ and the curve $y = \frac{8a^3}{x^2 + 4a^2}$.

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5. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$ divide the area of square bounded by $x = 0, x = 4, y = 4$ and $y = 0$ into three equal parts.

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6. Find the area bounded by the x-axis, part of the curve $y = \left(1 - \frac{8}{x^2}\right)$, and the ordinates at $x = 2andx = 4.$ If the ordinate at $x = a$ divides the area into two equal parts, then find $a\cdot$

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7. The area included between the parabolas $y^2 = 4x \; and \; x^2 = 4y$ is (in square units) a. 4/3 b. 1/3 c. 16/3 d. 8/3

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8. Find the area bounded by the curve $y = 2x - x^2$, and the line $y = x$

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9. The smaller area included between $y = \sqrt{4 - x^2}, y = x\sqrt{3}$ and the x-axis is

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10. For any real t,

$x = 2 + \frac{e^t + e^{-1}}{2}, y = 2 + \frac{e^t - e^{-t}}{2}$ is a point on the hyperbola $x^2 - y^2 - 4x + 4y - 1 = 0$. Find the area bounded by the hyperbola and the lines joining the center to the points corresponding to $t_1 \text{ and } -t_1$.

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11. The area included between the parabolas $y^2 = 4x \text{ and } x^2 = 4y$ is (in square units) a. 4/3 b. 1/3 c. 16/3 d. 8/3

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12. Find the area of the region bounded by the curve $y^2 = 4x$and the line $x = 3$.

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14. Find the area of the region included between $y^2 = 9x$ and $y = x$.

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15. Find the area bounded by $(x - y)(x + y) = 1$ and $x^2 + y^2 = 4, x > 0, y > 0.$

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16. Compute the area of the figure bounded by the straight lines $x = 0, x = 2$ and the curves $y = 2^x, y = 2x - x^2$.

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17. Find the area of the figure bounded by the parabolas $x = -2y^2, x = 1 - 3y^2$.

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18. Compute the area of the region in the first quadrant bounded by the curves $y^2 = 4x$ and $(x - 4)^2 + y^2 = 16$

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19. The area of the loop between the curve $y = a \sin x$ and x-axis is (A) a (B) $2a$ (C) $3a$ (D) none of these

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20. Find the area of the figure bounded by parabola $y = -x^2 - 2x + 3$, the tangent to it at the point $(2 - 5)$ and the y-axis.

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21. Find the area of the region lying in the first quadrant and included between the curves

$x^2 + y^2 = 3a^2.\ x^2 = 2ay$ and $y^2 = 2ax.\ a > 0$

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23. Find the area of the region enclosed by the curves $y = x \log x$ and $y = 2x - 2x^2.$

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24. The area enclosed by the circle $x^2 + (y+2)^2 = 16$ is divided into two parts by the x-axis. Find by integration, the area of the smaller part.

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25. Find the area bounded by the curves $x = y^2$ and $x = 3 - 2y^2$.

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26. Find the area bounded by the curve $2x^2 - y = 0$ and the lines $x = 3, y = 1$ and the x-axis all in first quadrant.

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27. Sketch the region bounded by the curve, $y = \frac{1}{2}\left(2 - 3x - 2x^2\right)$, below the line $y = x + 1$, and above the x-axis, also find its area.

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28. Using integration find the area of the region bounded by the curves $y = \sqrt{4 - x^2}, x^2 + y^2 - 4x = 0$ and the x-axis.

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29. If the area bounded by the curve y=f(x), x-axis and the ordinates x=1 and x=b is (b-1) $\sin$(3b+4), then find f(x).

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30. Find the area bounded by the curve $20y = 7 - 10x^2 + 20x^3 - 10x^4$, the axis of x and the two ordinates, corresponding to the points of maxima of this function.

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31. The area bounded between $y^2 = x$ and $y = |x|$ is

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32. Find the area of the region bounded by the curves $2y^2 = x, 3y^2 = x + 1, y = 0.$

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33. Find the area of the region which contains all points satisfying condition $|x - 2y| + x + 2y \mid \ \leq 8$ and $xy \geq 2.$

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34. Sketch the region bounded by the curves $y = x^2$ and $y = \dfrac{2}{1 + x^2}$. Find the area.

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35. Calculate the area bounded by the curve $y = x(3 - x)^2$ the x-axis and the ordinates of the maximum and minimum points of the curve.

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36. In what ratio does the x-axis divide the area of the region bounded by the parabolas $y = 4x - x^2 and y = x^2 - x$?

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37. Find the ratio in which the area bounded by the curves $y^2 = 12x and x^2 = 12y$ is divided by the line $x = 3$.

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38. Find the area enclosed by the curves $3x^2 + 5y = 32 and y = |x - 2|$.

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39. Find the area bounded by the curve $|y| + \frac{1}{2} \leq e^{-|x|}$.

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40. Find the value of t for which the area bounded by the lines $y = 0, x = 0, x = 1$ and the curve $y = t^2x^2 + tx + 1$ is minimum.

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41. Find the area bounded by the curves $y = \log x$ and $y = (\log x)^2$.

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42. Area bounded by the curves $y = x$ and $y = x^3$ is (A) $\frac{1}{2}$ (B) 1 (C) $\frac{3}{2}$ (D) 2

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43. Area bounded by the curves $y = x^2 - 1$ and $x + y = 3$ is:

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44. Area of the region bounded by the curve $y = 2^x, y = 2x - x^2, x = 0$ and $x = 2$ is given by

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45. Area bounded by the curves $y = x^2 - 1$ and $x + y = 3$ is:

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46. Find the area of the region bounded by the curves $y = x^2 + 2, y = x, x = 0, and x = 3.$

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47. AOB is the positive quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ in which $OA = a, OB = b$. Then find the area between the arc AB and the chord AB of the ellipse.

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48. The area bounded by the curve $y = x^4 - 2x^3 + x^2 + 3$, the x-axis and the two ordinates corresponding to the points of minimum of this function is (A) $\frac{11}{15}$ (B) $\frac{91}{30}$ (C) $\frac{91}{60}$ (D) none of these

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49. Find the area of the figure bounded by the parabolas $x = -2y^2, x = 1 - 3y^2$.

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50. Find the area of region bounded by $y = -1, y = 2, x = y^3 and x = 0.$

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51. Find the area of the region bounded by the curve C : y=tan x ,tangent drawn to C at x=pi/4, and the x-axis.

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52. Area of the region bounded by the curve $y = \begin{cases} x^2 & x < 0 \\ x & x \geq 0 \end{cases}$ and the line $y = 4$ is (A) $\frac{10}{3}$ (B) $\frac{20}{3}$ (C) $\frac{50}{3}$ (D) none of these

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53. The area inside the parabola $5x^2 - y = 0$ but outside the parabola $2x^2 - y + 9 = 0$ is $12\sqrt{3} sq units$ $6\sqrt{3} sq units$ $8\sqrt{3} sq units$ (d)

$4\sqrt{3} sq units$

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54. Using integration, find the area of the region bounded by the line $x - y + 2 = 0$, the curve $x = \sqrt{y}$ and $y - \text{axis}$

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55. The area cut off from a parabola by any double ordinate is k time the corresponding rectangle contained by the double ordinate and its distance from the vertex. Find the value of k ?

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56. If the line joining the points $(0, 3)$ and $(5, -2)$ is a tangent to the curve $y = \frac{C}{x+1}$, then the value of C is (a) 1 (b) -2 (c) 4 (d) none of these

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57. Area lying between the curves $y = \tan x, y = \cot x$ and x-axis, $x \in \left[0, \frac{\pi}{2}\right]$ is (A) $\frac{1}{2}\log 2$ (B) $\log 2$ (C) $2\log\left(\frac{1}{\sqrt{2}}\right)$ (D) none of these

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58. The area of the region bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is (A) 3 sq. units (B) 4 sq. units (C) 6 sq. units (D) 2 sq. units

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59. Find the area bounded by $y = xe^{|x|}$ and lines $|x| = 1, y = 0.$

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60. The area bounded by the curve $y = x|x|$, x-axis and the ordinates $x = -1$ & $x = 1$ is:

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61. The area $\{(x, y); x^2 \leq y \leq \sqrt{x}\}$ is equal to $\frac{1}{3}$ b. $\frac{2}{3}$ c. $\frac{1}{6}$ d. none of these

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62. The area enclosed by the curve $y = x^5$, the x-axis and the ordinates $x = -1, x = 1$ is (A) 0 (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) none of these

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63. If the area bounded by the curve y=f(x), x-axis and the ordinates x=1 and x=b is (b-1) $\sin$(3b+4), then find f(x).

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64. The area bounded by the curve $y = x^2$, the x-axis and the line $x = 2^{\frac{1}{3}}$ is divided into two equal areas by the line $x = k$. The value of k is (A) $2^{-\frac{2}{3}}$ (B) $2^{-\frac{1}{3}}$ (C) 1 (D) $2^{\frac{1}{3}} - 1$

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65. The area bounded by the curve $y^2 = 9x$ and the lines $x = 1, x = 4$ and $y = 0,$ in the first quadrant,is

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66. The area of the region bouonded by the curve $y = x - x^2$ between $x = 0$ and $x = 1$ is (A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{5}{6}$

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67. The area of the loop between the curve $y = a \sin x$ and x-axis is (A) a (B) $2a$ (C) $3a$ (D) none of these

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68. Area of the region bounded by the curve $y^2 = 4x$, y-axis and the line $y = 3$ is (A) 2 sq. units (B) $\frac{9}{4}$ sq. units (C) $6\sqrt{3}$ sq. units (D) none of these

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69. Area of the region bounded by the curve $y = \begin{cases} x^2 & x < 0 \\ x & x \geq 0 \end{cases}$ and the line $y = 4$ is (A) $\frac{10}{3}$ (B) $\frac{20}{3}$ (C) $\frac{50}{3}$ (D) none of these

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70. Area lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ and the lines $x = 0$ and $x = 2$ is:

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71. Area lying between the curves $y^2 = 4x$ and $y = 2x$ is:

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72. The area bounded by the curves $y = -\sqrt{-x}$ and $x = -\sqrt{-y}$ where $x, y \leq 0$

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73. Area bounded by the curve $xy^2 = a^2(a - x)$ and the y-axis is $\frac{\pi a^2}{2} squnits$ (b) $\pi a^2 squnits$ $3\pi a^2 squnits$ (d) None of these

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74. Find the area bounded by the curves $y = 2x - x^2$ and the straight line $y = -x$.

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75. Find the area between the curve $y = x \sin x$ and x-axis from $x = 0$ to $x = 2\pi$.

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76. The area bounded by the x-axis and the curve $y = 4x - y^2 - 3$ id

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77. The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

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78. The area of the region bounded by the curve $y = |x - 1|$ and $y = 1$ is:

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80. Area bounded by the parabola $y^2 = x$ and the line $2y = x$ is:

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81. The area enclosed by the curve $y^2 + x^4 = x^2$ is

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82. Area bounded by the curves $y = x^2 - 1 \text{ and } x + y = 3$ is:

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83. Area bounded by the parabola $y^2 = x$ and the line $2y = x$ is:

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84. Area of the curve $x^2 + y^2 = 2ax$ is (A) πa^2 (B) $2\pi a^2$ (C) $4\pi a^2$ (D) $\frac{\pi a^2}{2}$

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85. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$ is:

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86. Find the area bounded by the parabola $y = x^2 + 1$ and the straight line $x + y = 3$.

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87. The area of the region is 1st quadrant bounded by the y-axis, $y = \frac{x}{4}, y = 1 + \sqrt{x}, \text{ and } y = \frac{2}{\sqrt{x}}$ is

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88. Draw the graph of $y = \cos x \text{ and } y = \cos 2x$, on the same axis.

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89. Area between the x-axis and the curve $y = \cos x$, when $0 \leq x \leq 2\pi$ is:

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90. Prove that the area common to the two parabolas $y = 2x^2 \, and \, y = x^2 + 4 \, is \frac{32}{3}$ sq. units.

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91. The areas bounded by the curve $y = (\log)_e x \text{ and }$ x-axis and the straight line $x = e$ is a. e sq. units b. 1 sq. units c. $1 - \frac{1}{e}$ sq. units d. $1 + \frac{1}{e}$ sq. units

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92. Find the area bounded by the curve $y = 2x - x^2$, and the line $y = x$

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93. The area bounded by the x-axis, the curve $y = f(x)$, and the lines $x = 1, x = b$ is equal to $\sqrt{b^2 + 1} - \sqrt{2}$ for all $b > 1$, then $f(x)$ is

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94. Area bounded by the curves $y = x^2 - 1$ and $x + y = 3$ is:

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96. Find the area bounded by the curves $y = 2x - x^2$ and the straight line $y = -x$.

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97. The area between $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the straight line $\frac{x}{a} + \frac{y}{b} = 1$ is

(A) $\frac{1}{2}\pi ab$

(B) $\frac{1}{2}ab$

(C) $\frac{\pi ab}{4} - \frac{ab}{2}$

(D) $\frac{1}{4}ab$

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98. Consider curves $y = \frac{1}{x^2}, y = \frac{1}{4(x-1)}$. Let α be the value of $a(a > 2)$ for which area bounded by curves between $x = 2$ and $x = a$ is $1/a$ is $e^2 + 1$ and β be the of $b \in (1, 2)$, for which the area bounded by curves between x=b and $x = 2$ is $1 - \frac{1}{b}$, then

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100. The area bounded by the curves $y = \ln x, y = \ln|x|, y = |\ln x|$ and $y = |\ln|x| \;|$, for $x \in (-1, 1)$ is

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101. Area bounded by the curve $y = x^3$, the x-axis and the ordinates $x = -2$ and $x = 1$ is:

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102. The area of the region bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is (A) 6 sq. units (B) 2 sq. units (C) 3 sq. units (D) 4 sq. units

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103. The area bounded by the curves $y = \ln x$, $y = \ln|x|$, $y = |\ln x|$ and $y = |\ln|x||$, for $x \in (-1, 1)$ is

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104. Area bounded by the curves $y = x^2 - 1$ and $x + y = 3$ is:

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105. The area of the region bounded by the curves $y = |x - 2|, x = 1, x = 3$ and the x-axis is

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106. Find the area enclosed between the curve $y = x^2$, the axis and the ordinates x = 1 and x=2 .

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107. The parabolas $y^2 = 4xandx^2 = 4y$ divide the square region bounded by the lines $x = 4, y = 4$ and the coordinate axes. If S_1, S_2, S_3 are the areas of these parts numbered from top to bottom, respectively, then $S_1 : S_2 \equiv 1 : 1$ (b) $S_2 : S_3 \equiv 1 : 2$ $S_1 : S_3 \equiv 1 : 1$ (d) $S_1 : (S_1 + S_2) = 1 : 2$

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108. Let $f(x)$ be a non-negative continuous function such that the area bounded by the curve $y = f(x)$, the x-axis, and the ordinates $x = \frac{\pi}{4} and x = \beta > \frac{\pi}{4} is \beta \sin \beta + \frac{\pi}{4} \cos \beta + \sqrt{2}\beta$. Then $f\left(\frac{\pi}{2}\right)$ is $\left(\frac{\pi}{2} - \sqrt{2} - 1\right)$ (b) $\left(\frac{\pi}{4} + \sqrt{2} - 1\right) - \frac{\pi}{2}$ (c) $\left(1 - \frac{\pi}{4} + \sqrt{2}\right)$

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109. The area enclosed between the curves $y^2 = x and y = |x|$ is (1) 2/3 (2) 1 (3) 1/6 (4) 1/3

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110. The area of the plane region bounded by the curves $x + 2y^2 = 0$ and $x + 3y^2 = 1$ is equal to (1) $\frac{5}{3}$ (2) $\frac{1}{3}$ (3) $\frac{2}{3}$ (4) $\frac{4}{3}$

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111. The area bounded by the curves $y = \sqrt{x}, 2y + 3 = x,$ and x-axis in the 1st quadrant is 18 sq. units (b) $\frac{27}{4} s qu n \dot{i} t s$ $\frac{4}{3} s qu n \dot{i} t s$ (d) 9 sq. units

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112. The area enclosed between the curves $y = kx^2$ and $x = ky^2$, $(k > 0)$ is 1 sq. units. Then k is

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113. Evaluate: $\int \frac{e^x + 1}{e^x + x} dx$

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114. The function f is such that : $f(xy) = f(x) + f(y), x, y > 0$ and $f'(1) = 2$ and A the area bounded by the curves $y = f(x), x = 2$ and the x-axis, then (A) $f(x) = 2\log_e x$ (B) $f(x) = 2\log_e x$ (C) $A = 2(2\log_e 2 - 1)$ (D) $A = 4\log\left(\frac{2}{\sqrt{e}}\right)$

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115. For which of the following values of m is the area of the regions bounded by the curve $y = x - x^2$ and the line $y = mx$ equal $\frac{9}{2}$? -4 (b) -2 (c) 2 (d) 4

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116. Area bounded by the curves $y^2 = 4x$ and $y = 2x$ is equal to (A) $\int_0^1 \left(2\sqrt{x} - 2x\right)dx$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\int_0^2 \left(\frac{y}{2} - \frac{y^2}{4}\right)dy$

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117. The area of the region bounded by the curve $y = e^x$ and lines $x = 0 and y = e$ is $e - 1$ (b) $\int_1^e 1n(e + 1 - y)dy$ $e - \int_0^1 e^x dx$ (d) $\int_1^e 1nydy$

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118. Statement-1: The area bounded by the curve $y = x \sin x$, x-axis and ordinates $x = 0$ and $x = 2\pi$ is 4π.Statement-2: The area bounded by the curve $y = f(x)$, x-axis and two ordinates $x = a$ and $x = b$ is $\int_a^b |y| dx$.

(A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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119. Statement-1: The area bounded by the curve $y = 2x^2$ and $y = x^2 + 4$ is $\frac{32}{3}$ sq. units.Statement-2: The area bounded by the curves

$x = f(y), x = g(y)$ and two abscissae $y = c$ and $y = d$ is $\int_c^d |f(y) - g(y)| dy$.

(A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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120. Statement-1: The area bounded by the curves $y = x^2$ and $y = \frac{2}{1+x^2}$ is $2\pi - \frac{2}{3}$ Statement-2: The area bounded by the curves $y = f(x), y = g(x)$ and two ordinates $x = a$ and $x = b$ is $\int_a^b [f(x) - g(x)] dx$, if $f(x) > g(x)$.

(A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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121. Let the area bounded by the curve $y = f(x)$, x-axis and the ordinates $x = 1$ and $x = a$ be $(a - 1)\sin(3a + 4)$.

Statement-1: $f(x) = \sin(3x + 4) + 3(x - 1)\cos(3x + 4)$.

Statement-2: If $y = \int_{g(x)}^{h(x)} f(t)dt$, then $\frac{dy}{dx} = f(h(x))h'(x) - f(g(x))g'(x)$.

(A) Both 1 and 2 are true

(B) Both 1 and 2 are false

(C) 1 is true but 2 is false

(D) 1 is false but 2 is true

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122. Statement-1: The area of the region $R = \{(x, y) : |x| \le |y| \text{ and } x^2 + y^2 \le 1\}$ is $\frac{\pi}{4}$ sq. units.Statement-2: Curves $|y| = |x|$ and $x^2 + y^2 = 1$ symmetric about both x and y-axis. (A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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123. Statement-1: The area bounded by the curves $y = \ln|x|$, y-axis and $y = 1 - |x|$ is 2 sq. units.Statement-2: Both the curves $y = \log|x|$ and $y = 1 - |x|$ are symmetric about y-axis. (A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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124. Consider the polynomial f$(x) = 1 + 2x + 3x^2 + 4x^3$. Let s be the sum of all distinct real roots of $f(x)$and let $t = |s|$. The real number s lies in the interval.

(a) $\left(-\frac{1}{4}, 0\right)$

(b) $\left(-11, -\frac{3}{4}\right)$

(c) $\left(-\frac{3}{4}, -\frac{1}{2}\right)$

(d) $\left(0, \frac{1}{4}\right)$

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125. Consider the polynomial f$(x) = 1 + 2x + 3x^2 + 4x^3$. Let s be the sum of all distinct real roots of $f(x)$and let $t = |s|$.

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126. Consider the polynomial f$(x) = 1 + 2x + 3x^2 + 4x^3$. Let s be the sum of all distinct real roots of $f(x)$and let $t = |s|$.

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127. A normal to the curves $x^2 + kx - y + 2 = 0$ at the point P whose abscissa is 1 is parallel to the line, $y = x$. Now answer the question.The value of k is equal to (A) -3 (B) 1 (C) 0 (D) 2

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129. A normal to the curves $x^2 + kx - y + 2 = 0$ at the point P whose abscissa is 1 is parallel to the line, $y = x$. Now answer the question. The value of k is equal to

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130. Let $f(x) = \begin{cases} \frac{x^3 + 2x^2 - x - 2}{x^3 - 2x^2 - x + 2} & f \text{ or } |x| < 1 \\ x^2 + ax + b & f \text{ or } |x| \geq 1 \end{cases}$ be continuous for all x.

Now answer the question:The values of a and b are given by

$(A)\ a = -\frac{8}{3}, b = -\frac{4}{3}$

(B) $a = \frac{4}{3}, b = -\frac{8}{3}$

(C) $a = -\frac{4}{3}, b = -\frac{8}{3}$

(D) $a = -\frac{4}{3}, b = \frac{8}{3}$

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131. Consider the two curves $C_1 : y = 1 + \cos x$ and $C_2 : y = 1 + \cos(x - \alpha)$ for $\alpha \in \left(0, \frac{\pi}{2}\right)$, where Also the area of the figure bounded by the curves $C_1, C_2,$ and $x = 0$ is same as that of the figure bounded by $C_2, y = 1,$ and $x = \pi$.

The value of α is

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132. The area of bounded by $e^{\ln(x+1)} \geq |y|, |x| \leq 1$ is....

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133. Let $f(x) = \min . \left[\tan x, \cot x, \frac{1}{\sqrt{3}}\right], x \in \left[0, \frac{\pi}{2}\right]$. If the area bounded by $y = f(x)$ and x-axis is $\ln\left(\frac{a}{b}\right) + \frac{\pi}{6\sqrt{3}}$, where a, b are coprimes. Then ab=.....

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134. If Δ be the area between the curve $y = x^2 + x - 2$ and line $y = 2x$ for which $\left|x^2 + x - 2\right| + |2x| = \left|x^2 + 3x - 2\right|$ is satisfied, then 9Δ is equal to.....

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135. If Δ be the area in square units of the region bounded by the parabola $y = -x^2 - 2x + 3$, the line tangent to it at the point $P(2, -5)$ and the y-axis, then 3Δ is equal to...

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136. If the area bounded by the curve $y = \cos^{-1}(\cos x)$ and $y = |x - \pi|$ is $\frac{\pi^2}{n}$, then n is equal to...

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137. Let $f(x) = \min . \left\{\tan x, \cot x, \frac{1}{\sqrt{3}}\right\}, \forall x \in \left[0, \frac{\pi}{2}\right]$. If the area bounded by $y = f(x)$ and x-axis is $\ln\left(\frac{a}{b}\right) + \frac{\pi}{6\sqrt{3}}$, where a and b are coprime, then ab is equal to...

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