MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

APPLICATIONS OF INTEGRALS - FOR COMPETITION

Solved Examples

1. Find the area of the region bounded by the x-axis and the curves defined by $y = \tan x, \ -\frac{\pi}{3} \le x \le \frac{\pi}{3}$ and $y = \cot x, \ \frac{\pi}{6} \le x \le \frac{3\pi}{2}$

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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. The area of the region bounded by the curve $y = \tan x$, tangent drawn to the curve at $x = \frac{\pi}{4}$ and the x-axis is

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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 $y - ex(\log)_e x and y = \frac{\log x}{ex}$

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8. The line $y = mx$ bisects the area enclosed by the curve $y = 1 + 4x - x^2$ and the lines $x = 0, x = \frac{3}{2} and y = 0$. Then the value of m is $\frac{13}{6}$ b. $\frac{6}{13}$ c. $\frac{3}{2}$ d. 4

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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 co-ordinate axes. If the curve divides the area formed by these lines and co-ordinates axes in the ratio $m : n$, find the curve.

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11. Let C_1 and C_2, be the graph of the functions $y = x^2$ and $y = 2x, 0 \leq x \leq 1$ respectively. Let C_3, be the graph of a function $y - (fx), 0 \leq x \leq 1, f(0) = 0$. For a point Pand C_2, let the lines through P, parallel to the axes, meet C_2 and C_3, at Q and R respectively. If for every position of P (on C_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 $x^2 + y^2 - 4x + 2y + 1 = 0$

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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 $x \leq \frac{5}{2}$.

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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. Find the area of the region lying inside $x^2 + (y-1)^2 = 1$ and outside $c^2x^2 + y^2 = c^2$, where $c = \sqrt{2} - 1$.

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16. Consider a square with vertices at $(1, 1), (-1, 1), (-1, -1), and (1, -1)$. Set 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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17. 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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18. Let $f(x)$ be continuous function given by $f(x) = \{2x, |x| \leq 1x^2 + ax + b, |x| > 1\}$. 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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19. The area of the region included between the curves $x^2 + y^2 = a^2$ and $\sqrt{|x|} + \sqrt{|y|} = \sqrt{a}(a > 0)$ is

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

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22. Let $b \ne 0$ and for $j = 0, 1, 2, \ldots., n$. Let S_j be the area of the region bounded by Y_axis and the curve $x \cdot e^{ay} = \sin by$, $\frac{j\pi}{b} \le y \le \frac{(j+1)\pi}{b}$. 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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23. Find the area bounded by the curves $x^2 = y$, $x^2 = -y$ and $y^2 = 4x - 3$

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24. If $\begin{bmatrix} 4a^2 & 4a & 1 \\ 4b^2 & 4b & 1 \\ 4c^2 & 4c & 1 \end{bmatrix} \begin{bmatrix} f(-1) \\ f(1) \\ f(2) \end{bmatrix} \begin{bmatrix} 3a^2+3a \\ 3b^2+3b \\ 3c^2+3c \end{bmatrix}$,$f(x)$ is a quadratic function and its maximum valueoccurs 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 subtendsa right angle at V. Find the area enclosed by f(x) andchord AB.

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

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26. The area bounded by the parabola $y = (x+1)^2$ and $y = (x-1)^2$ and the line $y = \frac{1}{4}$ is (A) 4 sq. units (B) $\frac{1}{6}$ sq. units (C) $\frac{3}{4}$ sq. units (D) $\frac{1}{3}$ sq. units

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

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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 $g(x)\ \max.\ \left[x^2, f(x), |x|\right\}, -2\leq x\leq 2.$

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29. 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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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 bounded by the curve $y = (x+1)(x-1)(x+2)$ 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 the 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. Find the area included between the curves $y = x^2$ and $y = x^3$.

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

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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 $t, x = \frac{1}{2}(e^t + e^{-t}), y = \frac{1}{2}(e^t - e^{-t})$ is a point on the hyperbola $x^2 - y^2 = 1$ Show that the area bounded by the hyperbola and the lines joining its centre to the points corresponding to $t_1 and - t_1$ ist_1.

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11. Find the area included between the curve $y = \sqrt{8 - x^2}$, the tangent to it at the point with abscissa $x = -2$ and the x-axis.

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12. Find the area of the figure bounded by the curve $y = \sin^{-1} x$, the lines $x = 0$ and $y = \frac{\pi}{2}$.

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13. The area common to the circle $x^2 + y^2 = 64$ and the parabola $y^2 = 12x$ is equal to

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14. The area included between $x^2 + y^2 = 2ax$ and $y^2 = ax$ is

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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 $= 0, x = 2$ 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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22. The slope of the tangent to a curve $y = f(x)$ at $(x, f(x))$ is $2x + 1$. If the curve passes through the point $(1, 2)$ then the area of the region bounded by the curve, the x-axis and the line $x = 1$ is (A) $\frac{5}{6}$ (B) $\frac{6}{5}$ (C) $\frac{1}{6}$ (D) 1

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

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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. The area bounded by the curve $y = f(x)$, the x-axis and $x = 1 \text{ and } x = c$ is $(c - 1)\sin(3c + 4)$ Then f(x) is

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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. Find the area lying in the first quadrant, bounded by the curves $y^2 - x + 2 = 0$ and $y = |x - 2|$.

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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 ratio of the two areas bounded by the curve $y = x^2 \sin 2x$ (x being in radians) and the x-axis from $x = 0$ from $x = 0$ to $x = \pi$.

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34. Find the area of the region which is inside the parabola satisfying the condition $|x - 2y| + |x + 2y| \leq 8$ and $xy \geq 2$.

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35. Sketch the region bounded by the curves $y = x^2 andy = \frac{2}{1 + x^2}$.

Find the area.

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

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

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

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

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43. 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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44. Area bounded by the curves $|y| = 1 - x^2$ is (A) $\frac{4}{3}$ (B) $\frac{8}{3}$ (C) $\frac{16}{3}$ (D) none of these

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45. Area of the region bounded by the curves $y = 2^x, y = 2x - x^2, x = 0$ and $x = 2$ is given by (A) $3 \log 2 - \frac{4}{3}$ (B) $\frac{3}{\log 2} - \frac{4}{3}$ (C) $3 \log 2 + \frac{4}{3}$ (D) $\frac{3}{\log 2} + \frac{4}{3}$

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46. Area bounded by the curves $y = |x - 1|, y = 0$ and $|x| = 2$ is (A) 4 (B) 8 (C) 5 (D) 9

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47. Area of the region bounded by the curves $y = x^2 + 2, y = -x, x = 0$ and $x = 1$ is (A) $\frac{3}{6}$ (B) $\frac{5}{6}$ (C) $\frac{17}{6}$ (D) none of these

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48. 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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49. 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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50. Find the area of the figure bounded by the parabolas $x = -2y^2, x = 1 - 3y^2$.

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51. If the area of the region bounded by $y = \sin ax, y = 0, x = \frac{\pi}{a}$ and $x = \frac{\pi}{3a}$ is 4, then the positive value of a is (A) $\frac{1}{2}$ (B) 2 (C) $\frac{5}{8}$ (D) none of these

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52. The area of the region bounded by the curve $y = \tan x$, tangent drawn to the curve at $x = \frac{\pi}{4}$ and the x-axis is

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53. 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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54. The area inside the parabola $5x^2 - y = 0$ but outside the parabola $2x^2 - y + 9 = 0$ is $12\sqrt{3}squnits$ $6\sqrt{3}squnits$ $8\sqrt{3}squnits$ (d) $4\sqrt{3}squnits$

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55. Area of the region bounded by the line $x - y + 2 = 0$ and the curve $x = \sqrt{y}$ is (A) 9 (B) $\frac{16}{3}$ (C) $\frac{5}{3}$ (D) 4

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56. 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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57. Area common to the curves $y = x^3$ and $y = \sqrt{x}$ is (A) $\frac{5}{12}$ (B) $\frac{5}{4}$ (C) $\frac{5}{2}$ (D) none of these

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58. 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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59. The area of the region bounded by the curves y= | x-1 | and y = 3- l x l is:

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

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61. The area bounded by the curve $y = x|x|$, x-axis and the ordinates $x = -1, x = 1$ is (A) $\frac{5}{3}$ (B) $\frac{4}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{3}$

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62. 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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63. 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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64. The area bounded by the curves $y = f(x)$, the x-axis, and the ordinates $x = 1 and x = b$ is $(b-1)\sin(3b+4)\cdot$ Then $f(x)$ is.

$(x-1)\cos(3x+4)$ $\sin(3x+4)$ $\sin(3x+4) + 3(x-1)\cos(3x+4)$

None of these

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65. 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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66. 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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67. 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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68. 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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69. 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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70. Area between the curve $y = 4 + 3x - x^2$ and x-axis in sq. units is (A) $\frac{125}{3}$ (B) $\frac{125}{4}$ (C) $\frac{125}{6}$ (D) none of these

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71. 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(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

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72. Area lying between the curves $y^2 = 4x$and $y = 2x$is(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{3}{4}$

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73. Area common to the curves $y = \sqrt{x}$ and $x = \sqrt{y}$ is (A) 1 (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) none of these

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

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

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

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78. Area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$is πab

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

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80. The slope of the tangent to a curve $y = f(x)$ at $(x, f(x))$ is $2x + 1$. If the curve passes through the point $(1, 2)$ then the area of the region bounded by the curve, the x-axis and the line $x = 1$ is (A) $\frac{5}{6}$ (B) $\frac{6}{5}$ (C) $\frac{1}{6}$ (D) 1

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81. The area bounded by the parabola $y^2 = x$, straight line $y = 4$ and y-axis is

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82. The area enclosed between the curve $y^2 = 4x$ and the line $y = x$ is

(A) $\frac{8}{3}$ (B) $\frac{4}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$

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83. Area bounded by the lines $y = 2 + x$, $y = 2 - x$ and $x = 2$ is (A) 3

(B) 4 (C) 8 (D) 16

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84. Area bounded by the parabola $y^2 = x$ and the line $2y = x$ is (A) $\frac{4}{3}$

(B) 1 (C) $\frac{2}{3}$ (D) $\frac{1}{3}$

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85. 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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86. Area enclosed by the parabola $y^2 = 8x$ and the line $y = 2x$ is (A) $\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$

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

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88. The area of the region bounded by the lines $x = 0, x = \frac{\pi}{2}$ and $f(x) = \sin x, g(x) = \cos x$ is (A) $2(\sqrt{2} + 1)$ (B) $\sqrt{3} - 1$ (C) $2(\sqrt{3} - 1)$ (D) $2(\sqrt{2} - 1)$

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89. The ratio of the areas between the curves $y = \cos x$ and $y = \cos 2x$ and x-axis from $x = 0$ to $x = \frac{\pi}{3}$ is (A) $1:3$ (B) $2:1$ (C) $\sqrt{3}:1$ (D) none of these

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90. Area between the x-axis and the curve $y = \cos x$, when $0 \leq x \leq 2\pi$ is (A) 0 (B) 2 (C) 3 (D) 4

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91. The area common to the parabolas $y = 2x^2$ and $y = x^2 + 4$ (in square units) is (A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) $\frac{32}{3}$ (D) $\frac{3}{32}$

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92. The area bounded by the curve $y = \log_e x$, the x-axis and the line $x = e$ is (A) e sq. units (B) 1 sq. unit (C) $\left(1 - \frac{1}{e}\right)$ sq. units (D) $\left(1 + \frac{1}{e}\right)$ sq. units

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93. The area bounded by the curve $y = x^3$, x-axis and two ordinates $x = 1$ and $x = 2$ is equal to (A) $\frac{15}{2}$ sq. units (B) $\frac{15}{4}$ sq. units (C) $\frac{17}{2}$ sq. units (D) $\frac{17}{4}$ sq. units

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94. The area bounded by the curve $y = 4x - x^2$ and x-axis is (A) $\frac{30}{7}$ sq. units (B) $\frac{31}{7}$ sq. units (C) $\frac{32}{3}$ sq. units (D) $\frac{34}{3}$ sq. units

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95. The area of the region bounded by the curve $y = 2x - x^2$ and the line $y = x$ is

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96. 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 $\sqrt{x - 1}$ (b) $\sqrt{x + 1}$ $\sqrt{x^2 + 1}$ (d) $\frac{x}{\sqrt{1 + x^2}}$

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97. The area formed by triangular shaped region bounded by the curves $y = \sin x, y = \cos x$ and $x = 0$ is (A) $\sqrt{2} - 1$ (B) 1 (C) $\sqrt{2}$ (D) $1 + \sqrt{2}$

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98. The triangle formed by the tangent to the curve $f(x) = x^2 + bx - b$ at the point $(1, 1)$ and the coordinate axes, lies in the first quadrant. If its area is 2, then the value of b is (a) -1 (b) 3 (c) -3 (d) 1

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

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100. 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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101. The area bounded by the curves $y = |x| - 1 and y = -|x| + 1$ is 1 sq. units (b) 2 sq. units $2\sqrt{2}$ sq. units (d) 4 sq. units

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102. The area of the figure bounded by the curves $y = \cos x$ and $y = \sin x$ and the ordinates $x = 0$ and $x = \frac{\pi}{4}$ is (A) $\sqrt{2} - 1$ (B) $\sqrt{2} + 1$ (C) $\frac{1}{\sqrt{2}}\left(\sqrt{2} - 1\right)$ (D) $\frac{1}{\sqrt{2}}$

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103. The area bounded by the curves y=lnx, y=ln|x|, y=|lnx| and y=|ln||x| is

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104. The area bounded by the curve $y = \sec x$, the x-axis and the lines $x = 0$ and $x = \frac{\pi}{4}$ is (A) $\log(\sqrt{2} + 1)$ (B) $\log(\sqrt{2} - 1)$ (C) $\frac{1}{2}\log 2$ (D) $\sqrt{2}$

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105. 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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106. The area bounded by the curves y=lnx, y=ln|x|, y=|lnx| and y=|ln||x| is

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107. 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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108. The area of the region bounded by the curves $y = |x - 2|$, x=1, x=3

and $thex - a\xi sis(A)$3(B)2(C)1(D)4`

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109. The area enclosed between the curve $y = \log_e(x + e)$ and the coordinate axes is

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110. The parabola $x^2 = 4y$ and $y^2 = 4x$ divide the square region bounded by the lines $x = 4$, $y = 4$ and the coordinate axes. If S_1, S_2, S_3 are respectively the areas of these parts numbered from top to bottom, then $S_1 : S_2 : S_3$ is (A) $2 : 1 : 2$ (B) $1 : 2 : 1$ (C) $1 : 2 : 3$ (D) $1 : 1 : 1$

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111. 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) $\left(\frac{\pi}{4} + \sqrt{2} - 1\right) - \frac{\pi}{2}$ (d) $\left(1 - \frac{\pi}{4} - \sqrt{2}\right)$

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112. 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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113. 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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114. 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 i t s $\frac{4}{3}$s qu n i t s (d) 9 sq. units

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115. The area enclosed between the curves $y = ax^2$ and $x = ay^2 (a > 0)$ is 1 sq. unit, value of a is $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{2}$ (c) 1 (d) $\frac{1}{3}$

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116. The area bounded by $y = \left|e^{|x|} - e^{-x}\right|$, the x-axis and $x = 1$ is (A) $\int_0^1 \left(e^x - e^{-x}\right)dx$ (B) $e + e^{-1} - 2$ (C) $e + e^{-1} + 2$ (D) $\left(\sqrt{e} - \frac{1}{\sqrt{e}}\right)^2$

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117. 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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118. 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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119. Area bounded by the curves $y^2 = 4x$ and $y = 2x$ is equal to (A) $\int_0^1 (2\sqrt{x} - 2x)dx$ (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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120. 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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121. 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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122. 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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123. 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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124. 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 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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125. Statement-1: The area of the region $R = \{(x, y) : |x| \leq |y| \text{ and } x^2 + y^2 \leq 1\}$ 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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126. 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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127. 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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128. 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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129. 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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130. 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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131. 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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132. 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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133. 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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134. 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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The value of α is

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

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138. 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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139. 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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140. 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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141. 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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142. 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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