



## MATHS

### BOOKS - CENGAGE MATHS (ENGLISH)

#### APPLICATION OF INTEGRALS

##### Others

1. Find the area of the figure enclosed by the curve  $5x^2 + 6xy + 2y^2 + 7x + 6y + 6 = 0$ .

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2. If the area by  $y = x^2 + 2x - 3$  and the line  $y = kx + 1$  is the least, find  $k$  and also the least area.

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3. Area enclosed by the curve  $y = f(x)$  defined parametrically as  $x = \frac{1-t^2}{1+t^2}$ ,  $y = \frac{2t}{1+t^2}$  is equal

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4. Sketch and find the area bounded by the curve  $\sqrt{|x|} + \sqrt{|y|} = \sqrt{a}$  and  $x^2 + y^2 = a^2$  (where  $a > 0$ ). If curve  $|x| + |y| = a$  divides the area in two parts, then find their ratio in the first quadrant only.

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5. Let  $f(x) = \min(x + 1, \sqrt{1-x})$  for all  $x \leq 1$ . Then the area bounded by  $y = f(x)$  and the x-axis is (a)  $\frac{7}{3}$  sq units (b)  $\frac{1}{6}$  sq units (c)  $\frac{11}{6}$  sq units (d)  $\frac{7}{6}$  sq units

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6. The area enclosed by  $2|x| + 3|y| \leq 6$  is 3 sq. units (b) 4 sq. units 12 sq. units (d) 24 sq. units

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7. If  $A_n$  is the area bounded by  $y = x$  and  $y = x^n$ ,  $n \in \mathbb{N}$ , then  $A_2 A_3 \dots A_n =$  (a)  $\frac{1}{n(n+1)}$  (b)  $\frac{1}{2^n n(n+1)}$  (c)  $\frac{1}{2^{n-1} n(n+1)}$  (d)  $\frac{1}{2^{n-2} n(n+1)}$

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8. Area enclosed between the curves  $|y| = 1 - x^2$  and  $x^2 + y^2 = 1$  is (a)  $\frac{3\pi - 8}{3}$  (b)  $\frac{\pi - 8}{3}$  (c)  $\frac{2\pi - 8}{3}$  (d) None of these

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9. If the area of bounded between the x-axis and the graph of  $y = 6x - 3x^2$  between the ordinates  $x = 1$  and  $x = a$  is 19 units, then  $a$

can take the value: (A) 4 or -2 (B) one value is in (2, 3) and one in (-1, 0) (C) one value is in (3, 4) and one in (-2,-1) (D) none of these



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10. The area enclosed between the curves  $y = (\log)_e(x + e)$ ,  $x = (\log)_e\left(\frac{1}{y}\right)$ , and the x-axis is (a) 2squnits (b) 1squnits (c) 4squnits (d) none of these



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11. If  $A_n$  be the area bounded by the curve  $y = (\tan x)^n$  and the lines  $x = 0$ ,  $y = 0$ ,  $x = \pi/4$ , then for  $n > 2$ .

A. a.  $A_n + A_{n-1} = \frac{1}{n-1}$

B. b.  $A_n + A_{n-2} < \frac{1}{n-1}$

C. c.  $A_n + A_{n-2} = \frac{1}{n-1}$

D. d. none of these

**Answer: null**



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



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**13.** In the hexaploid wheat, the haploid ( $n$ ) and basic ( $x$ ) numbers of chromosomes are



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**14.** Let  $O(0, 0)$ ,  $A(2, 0)$ , and  $B\left(1, \frac{1}{\sqrt{3}}\right)$  be the vertices of a triangle. Let  $R$  be the region consisting of all those points  $P$  inside  $OAB$  which

satisfy  $d(P, OA) \leq \min [d(p, OB), d(P, AB)]$  , where  $d$  denotes the distance from the point to the corresponding line. Sketch the region  $R$  and find its area.

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15. A copper rod of mass  $m$  rests on two horizontal rails distance  $L$  apart and carries a current of  $I$  from one rail to the other. The coefficient of static friction between rod and rails is  $\mu_s$ . What are the (a) magnitude and (b) angle (relative to the vertical) of the smallest magnetic field that puts the rod on the verge of sliding?

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16. 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

A. (a)  $\sqrt{x - 1}$

B. (b)  $\sqrt{x + 1}$

C. (c)  $\sqrt{x^2 + 1}$

D. (d)  $\frac{x}{\sqrt{1 + x^2}}$

**Answer:** null



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17. A particle moves along x-axis such that its position varies with time as  $x = 50t - 5t^2$ . Select the correct alternative (s).



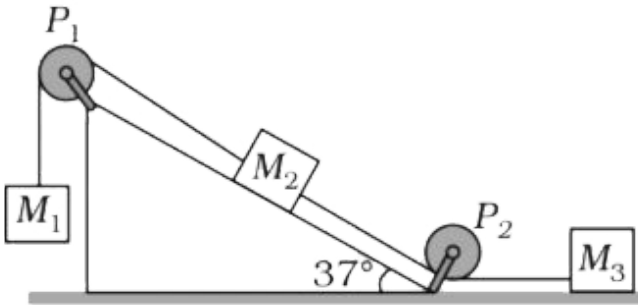
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18. Masses  $M_1$ ,  $M_2$  and  $M_3$  are connected by strings of negligible mass which pass over massless and frictionless pulleys  $P_1$  and  $P_2$  as shown in the figure. The masses move such that the portion of the string between  $P_1$  and  $P_2$  is parallel to the inclined plane and the portion of the string between  $P_2$  and  $M_3$  is horizontal. The masses  $M_2$  and  $M_3$  are 4.0 kg each and the coefficient of kinetic friction between both the masses and the

surfaces is 0.25. The inclined plane makes an angle of  $37^\circ$  with the horizontal. If the mass  $M_1$  moves downwards with a uniform velocity, find

(i) the mass of  $M_1$  in kg

(ii) the tension in the horizontal portion of the string in Newton



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19. The area bounded by the two branches of curve  $(y - x)^2 = x^3$  and the straight line  $x = 1$  is (a)  $\frac{1}{5}$  squnits (b)  $\frac{3}{5}$  squnits (c)  $\frac{4}{5}$  squnits (d)  $\frac{8}{4}$  squnits

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20. The area bounded by the curves  $y = \log_e x$  and  $y = (\log_e x)^2$  is (A)  $e - 2$  sq. units (B)  $3 - e$  sq. units (C)  $e$  sq. units (D)  $e - 1$  sq. units

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21. The area of the region containing the points  $(x, y)$  satisfying  $4 \leq x^2 + y^2 \leq 2(|x| + |y|)$  is (a)  $8$  sq units (b)  $2$  sq units (c)  $4\pi$  sq units (d)  $2\pi$  sq units

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22. Let  $f(x) = x^3 + 3x + 2$  and  $g(x)$  be the inverse of it. Then the area bounded by  $g(x)$ , the x-axis, and the ordinate at  $x = -2$  and  $x = 6$  is (a)  $\frac{9}{4}$  sq units (b)  $\frac{4}{3}$  sq units (c)  $\frac{5}{4}$  sq units (d)  $\frac{7}{3}$  sq units

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23. Consider two curves  $C_1: y^2 = 4[\sqrt{y}]x$  and  $C_2: x^2 = 4[\sqrt{x}]y$ , where  $[\cdot]$  denotes the greatest integer function. Then the area of region enclosed by these two curves within the square formed by the lines  $x = 1, y = 1, x = 4, y = 4$  is (a)  $\frac{8}{3}$  sq units (b)  $\frac{10}{3}$  sq units (c)  $\frac{11}{3}$  sq units (d)  $\frac{11}{4}$  sq units



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24. The area enclosed between the curve  $y^2(2a - x) = x^3$  and the line  $x = 2a$  above the x-axis is (a)  $\pi a^2$  sq units (b)  $\frac{3\pi a^2}{2}$  sq units (c)  $2\pi a^2$  sq units (d)  $3\pi a^2$  sq units



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25. The area of the region of the plane bounded by  $\max(|x|, |y|) \leq 1$  and  $xy \leq \frac{1}{2}$  is  
(a)  $\frac{1}{2} + \ln 2$  sq units  
(b)  $3 + \ln 2$  sq units

(c)  $\frac{31}{4}$  sq. units

(d)  $1 + 2 \ln 2$  sq. units



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26. The area of the figure bounded by the parabola  $(y - 2)^2 = x - 1$ , the tangent to it at the point with the ordinate  $y=3$ , and the x-axis is



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27. The area of the loop of the curve  $ay^2 = x^2(a - x)$  is

A. (a)  $4a^2$  sq units

B. (b)  $\frac{8a^2}{15}$  sq units

C. (c)  $\frac{16a^2}{9}$  sq units

D. (d) None of these

Answer: null



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28. The area of the region bounded by  $x = 0$ ,  $y = 0$ ,  $x = 2$ ,  $y = 2$ ,  $y \leq e^x$  and  $y \geq \ln x$  is (a)  $6 - 4\ln 2$  sq units  
(b)  $4\ln 2 - 2$  sq units (c)  $2\ln 2 - 4$  sq units (d)  $6 - 2\ln 2$  sq units

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29. If  $f(x) = \sin x$ ,  $\forall x \in \left[0, \frac{\pi}{2}\right]$ ,  $f(x) + f(\pi - x) = 2$ ,  $\forall x \in \left(\frac{\pi}{2}, \pi\right]$  and  $f(x)$  then the area enclosed by  $y = f(x)$  and the x-axis is
- (a)  $\pi$  sq. units  
(b)  $2\pi$  sq. units  
(c)  $2$  sq. units  
(d)  $4$  sq. units

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30. The area enclosed by the curve  $y = \sqrt{4 - x^2}$ ,  $y \geq \sqrt{2} \sin\left(\frac{x\pi}{2\sqrt{2}}\right)$ , and the x-axis is divided by the y-axis in the ratio.

(a)  $\frac{\pi^2 - 8}{\pi^2 + 8}$

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

(c)  $\frac{\pi - 4}{\pi - 4}$

(d)  $\frac{2\pi^2}{2\pi + \pi^2 - 8}$



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31. The area bounded by the curves  $y = xe^x$ ,  $y = xe^{-x}$  and the lines  $x = 1$  is



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32. The area enclosed by the curves  $xy^2 = a^2(a - x)$  and  $(a - x)y^2 = a^2x$  is



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33. The area bounded by the loop of the curve  $4y^2 = x^2(4 - x^2)$  is (a)  $7/3$  sq. units (b)  $\frac{8}{3}$  sq units (c)  $\frac{11}{3}$  sq units (d)  $\frac{16}{3}$  sq units

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34. The area bounded by the curve  $f(x) = x + \sin x$  and its inverse function between the ordinates  $x = 0$  and  $x = 2\pi$  is (a)  $4\pi$  sq units (b)  $8\pi$  sq units (c)  $4$  sq units (d)  $8$  sq units

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35. The area enclosed by the curve  $y = \sin x + \cos x$  and  $y = |\cos x - \sin x|$  over the interval  $\left[0, \frac{\pi}{2}\right]$  is (a)  $4(\sqrt{2} - 2)$  (b)  $2\sqrt{2}(\sqrt{2} - 1)$  (c)  $2(\sqrt{2} + 1)$  (d)  $2\sqrt{2}(\sqrt{2} + 1)$

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36. 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  $\frac{9}{2}$ ? (a)  $-4$   
(b)  $-2$  (c)  $2$  (d)  $4$

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37. The area of the region bounded by the curve  $y = e^x$  and lines  $x=0$  and  $y=e$  is

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

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39. For a point  $P$  in the plane, let  $d_1(P)$  and  $d_2(P)$  be the distances of the point  $P$  from the lines  $x - y = 0$  and  $x + y = 0$  respectively. The area of

the region  $R$  consisting of all points  $P$  lying in the first quadrant of the plane and satisfying  $2 \leq d_1(P) + d_2(P) \leq 4$ , is

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40. If  $a(a > 0)$  is the value of parameter for each of which the area of the figure bounded by the straight line  $y = \frac{a^2 - ax}{1 + a^4}$  and the parabola  $y = \frac{x^2 + 2ax + 3a^2}{1 + a^4}$  is the greatest, then the value of  $a^4$  is \_\_\_

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41. Consider two curves  $C_1: y = \frac{1}{x}$  and  $C_2: y = 1/x$  on the  $xy$  plane. Let  $D_1$  denotes the region surrounded by  $C_1, C_2$ , and the line  $x = 1$  and  $D_2$  denotes the region surrounded by  $C_1, C_2$  and the line  $x = a$ . If  $D_1 = D_2$ , then the sum of logarithm of possible value of  $a$  is \_\_\_\_\_

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42. Find the area bounded by  $y^2 \leq 4x$ ,  $x^2 + y^2 \geq 2x$ , and  $x \leq y + 2$  in the first quadrant.

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43. Find the area of the region  $R$  which is enclosed by the curve  $y \geq \sqrt{1 - x^2}$  and  $\max\{|x|, |y|\} \leq 4$ .

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

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45. Find the area of the region  $\{(x, y) : y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$

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

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47. Find the area bounded by  $y = \frac{1}{x^2 - 2x + 2}$  and x-axis.

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48. Find the area bounded by  $x = 2y - y^2$  and the  $y$  - axis.

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49. Find the area bounded by  $y = \sin^{-1} x$ ,  $y = \cos^{-1} x$ , and the  $X$ -axis.

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50. Draw a rough sketch of the curve  $y=(x - 1)^2(x - 2)(x - 3)^3$



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51. Find the area bounded by (a)  $y = (\log)_e|x|$  and  $y = 0$  (b)

$$y = |(\log)_e|x|| \quad \text{and} \quad y = 0$$



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52. Sketch the curves and identity the region bounded by

$$x = \frac{1}{2}, x = 2, y = \ln x, \text{ and } y = 2^x. \text{ Find the area of this region.}$$



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

Find the area.



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54. 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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55. 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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56.  $AOB$  is the positive quadrant of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  which has  $OA = a$ ,  $OB = b$ . Then find the area between the arc  $AB$  and the chord  $AB$  of the ellipse.

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57. Find the area bounded by the curves  $y = \sin x$  and  $y = \cos x$  between two consecutive points of the intersection.

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58. 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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59. 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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60. Find the area bounded by  $y = x^3 - x$  and  $y = x^2 + x$ .



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61. Find the area, lying above the  $x$ -axis and included between the circle  $x^2 + y^2 = 8x$  and the parabola  $y^2 = 4x$ .



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62. Consider the region formed by the lines  $x = 0$ ,  $y = 0$ ,  $x = 2$ ,  $y = 2$ . If the area enclosed by the curves  $y = e^x$  and  $y = \ln x$ , within this region, is being removed, then find the area of the remaining region.



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63. Find the area bounded by the curve  $y = (x - 1)(x - 2)(x - 3)$  lying between the ordinates  $x = 0$  and  $x = 3$ .



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



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65. Find the area of the closed figure bounded by the curves  $y = \sqrt{x}$ ,  $y = \sqrt{4 - 3x}$  and  $y = 0$



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66. Find the area of the smaller part of the circle  $x^2 + y^2 = a^2$  cut off by the line  $x = \frac{a}{\sqrt{2}}$



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67. The area enclosed by the curve  $c: y = x\sqrt{9 - x^2}$  ( $x \geq 0$ ) and the x-axis is \_\_\_\_\_

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68. The area bounded by the curves  $y = x(x - 3)^2$  and  $y = x$  is \_\_\_\_\_ (in sq. units)

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69. Column I, Column II Area enclosed , q. 1. sq. units The smaller area included between the curves  $\sqrt{x} + \sqrt{|y|} = 1$  and  $|x| + |y| = 1$  , r. 4 sq. units Area bounded by the curves  $y = \left[ \frac{x^2}{64} + 2 \right]$  (where  $[\cdot]$  denotes the greatest integer function),  $y = x - 1$  and  $x = 0$  above the x-axis., s.  $2/3$  sq. units

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70. Consider two regions:  $R_1$ : Point  $P$  is nearer to  $(1, 0)$  than to  $x = -1$ .  $R_2$ : Point  $P$  is nearer to  $(0, 0)$  than to  $(8, 0)$ . Then which of the following statements are true: *Statement1*: The area of the region common to  $R_1$  and  $R_2$  is  $\frac{128}{3}$  squnits. *Statement2*: The area bounded by  $x = 4\sqrt{y}$  and  $y = 4$  is  $\frac{32}{3}$  squnits.

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71. Statement 1 : The area bounded by  $2 \geq \max|x - y|, |x|y|$  is 8 sq. units. Statement 2 : The area of the square of side length 4 is 16 sq. units.

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72. Statement 1 : The area enclosed between the parabolas  $y^2 - 2y + 4x + 5 = 0$  and  $x^2 + 2x - y + 2 = 0$  is same as that of bounded by curves  $y^2 = -4x$  and  $x^2 = y$ . Statement 2 : Shifting of origin to point  $(h, k)$  does not change the bounded area.

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73. If the area bounded by the curve  $y = x^2 + 1$ ,  $y = x$  and the pair of lines  $x^2 + y^2 + 2xy - 4x - 4y + 3 = 0$  is  $K$  units, then the area of the region bounded by the curve  $y = x^2 + 1$ ,  $y = \sqrt{x-1}$  and the pair of lines  $(x + y - 1)(x + y - 3) = 0$  is

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74. Let  $S$  be the area bounded by the curve  $y = \sin x$  ( $0 \leq x \leq \pi$ ) and the x-axis and  $T$  be the area bounded by the curves  $y = \sin x$  ( $0 \leq x \leq \frac{\pi}{2}$ ),  $y = a \cos x$  ( $0 \leq x \leq \frac{\pi}{2}$ ), and the x-axis ( $where a \in R^+$ ) The value of  $(3a)$  such that  $S:T = 1:\frac{1}{3}$  is\_\_\_\_\_

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75. Let  $C$  be a curve passing through  $M(2, 2)$  such that the slope of the tangent at any point to the curve is reciprocal of the ordinate of the



the shaded regions  $OPQ$  and  $ORP$  are equal, determine the function

$$f(x)$$

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78. Find the area bounded by the curves  $x^2 = y$ ,  $x^2 = -y$  and  $y^2 = 4x - 3$

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79. 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  $x=1$ , is

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80. At freezing point of a solution there is always

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81. 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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82. 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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83. The area bounded by the parabolas  $y = (x + 1)^2$  and  $y = (x - 1)^2$  and the line  $y = \frac{1}{4}$  is 4 sq. units (b)  $\frac{1}{6}$  sq. units  $\frac{4}{3}$  sq. units (d)  $\frac{1}{3}$  sq. units

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84. The area bounded by the curves  $y = \sqrt{x}$ ,  $2y + 3 = x$ , and x-axis in the 1st quadrant is (A) 18 sq. units (B)  $\frac{27}{4}$  sq.units (C)  $\frac{4}{3}$  sq.units (D) 9 sq. units

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85. Find the area bounded by  $y = \tan^{-1} x$ ,  $y = \cot^{-1} x$ , and y-axis in the first quadrant.

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86. the equation to the director circle of  $\frac{x^2}{6} + \frac{y^2}{4} = 1$  is

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87. Find the area bounded by  $y = \log_e x$ ,  $y = -\log_e x$ ,  $y = \log_e(-x)$ , and  $y = -\log_e(-x)$ .

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88. the area of region for which  $0 < y < 3 - 2x - x^2$  and  $x > 0$  is

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89. The area common to regions  $x^2 + y^2 - 2x \leq 0$  and  $y \geq \sin(\pi x/2)$

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90. Draw the rough sketch of the curve  $y = x^4 - x^2$ .

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91.  $f(x)$  is a continuous and bijective function on  $R$ . If  $\forall t \in R$ , then the area bounded by  $y = f(x)$ ,  $x = a - t$ ,  $x = a$ , and the x-axis is equal to

the area bounded by  $y = f(x)$ ,  $x = a + t$ ,  $x = a$ , and the x-axis. Then

prove that  $\int_{-\lambda}^{\lambda} f^{-1}(x) dx = 2a\lambda$  (given that  $f(a) = 0$ ).

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92. Find the continuous function  $f$  where  $(x^4 - 4x^2) \leq f(x) \leq (2x^2 - x^3)$  such that the area bounded by  $y = f(x)$ ,  $y = x^4 - 4x^2$ , then y-axis, and the line  $x = t$ , where  $(0 \leq t \leq 2)$  is  $k$  times the area bounded by  $y = f(x)$ ,  $y = 2x^2 - x^3$ , y-axis, and line  $x = t$  (where  $0 \leq t \leq 2$ ).

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93. Find the area bounded by the curves  $y = -x^2 + 6x - 5$ ,  $y = -x^2 + 4x - 3$ , and the straight line  $y = 3x - 15$  and lying right to  $x = 1$ .

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94. Find the value of  $a$  where ( $a > 2$ ) for which the reciprocal of the area enclosed between  $y = \frac{1}{x^2}$ ,  $y = \frac{1}{4(x-1)}$ ,  $x = 2$ , and  $x = a$  is  $a$  itself and for what values of  $b \in (1, 2)$ , the area of the figure bounded by the lines  $x = b$  and  $x = 2$  is  $1 - \frac{1}{b}$ .

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95. if  $A_1, A_2, A_3, \dots, A_{100}$  are set of  $A_1 \supset A_2 \supset A_3 \supset A_4 \dots \supset A_{100}$   
 $n(A_i) = i + 2$ ,  $\cap_{i=3}^{100} A_i =$

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96. Draw the rough sketch of  $y^2 + 1 = x$ ,  $x \leq 2$ . Find the area enclosed by the curve and the line  $x = 2$ .

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97. Each question has four choices a,b,c and d, out of which only one is correct. Each question contains STATEMENT 1 and STATEMENT 2. If both the statements are TRUE and STATEMENT 2 is the correct explanation of STATEMENT 1 If both the statements are TRUE but STATEMENT 2 is NOT the correct explanation of STATEMENT 1. If STATEMENT 1 is TRUE and STATEMENT 2 is FALSE. If STATEMENT 1 is FALSE and STATEMENT 2 is TRUE.

Statement 1 : The area bounded by  $y = e^x$ ,  $y = 0$  and  $x = 0$  is 1 sq. units. Statement 2 : The area bounded by  $y = (\log)_e x$ ,  $x = 0$ , and  $y = 0$  is 1 sq. units.



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98. If  $A_1, A_2, A_3, \dots$  are sets such that  $n(A_i) = 101 - i$ ,  $A_1 \supset A_2 \supset A_3 \supset \dots \supset A_{100}$  and  $A = \bigcap_{i=5}^{100} A_i$  then  $n(A)$  is equal to



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99. Let  $A(k)$  be the area bounded by the curves  $y = x^2 - 3$  and  $y = kx + 2$ . The range of  $A(k)$  is  $\left(\frac{10\sqrt{5}}{3}, \infty\right)$ . The range of  $A(k)$  is  $\left(\frac{20\sqrt{5}}{3}, \infty\right)$ . If function  $kA(k)$  is defined for  $k \in [-2, \infty)$ , then  $A(k)$  is many-one function. The value of  $k$  for which area is minimum is 1.

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100.  $\int (ax^2 + bx + c) dx =$

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101. Find a continuous function  $f$ , where  $(x^4 - 4x^2) \leq f(x) \leq (2x^2 - x^3)$  such that the area bounded by  $y = f(x)$ ,  $y = x^4 - 4x^2$ , the  $y$ -axis, and the line  $x = t$ , where  $(0 \leq t \leq 2)$  is  $k$  times the area bounded by  $y = f(x)$ ,  $y = 2x^2 - x^3$ ,  $y$ -axis, and line  $x = t$  (where  $0 \leq t \leq 2$ ).

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**102.** The parabolas  $y^2 = 4x$  and  $x^2 = 4y$  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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**103.** Statement 1 : The area bounded by parabola  $y = x^2 - 4x + 3$  and  $y = 0$  is  $\frac{4}{3}$  sq. units. Statement 2 : The area bounded by curve  $y = f(x) \geq 0$  and  $y = 0$  between ordinates  $x = a$  and  $x = b$  (where  $b > a$ ) is  $\int_a^b f(x) dx$

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104.  $f(x)$  is a polynomial of degree 3 passing through the origin having local extrema at  $x = \pm 2$  Statement 1 : Ratio of areas in which  $f(x)$  cuts the circle  $x^2 + y^2 = 36$  is 1:1. Statement 2 : Both  $y = f(x)$  and the circle are symmetric about the origin.

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105.  $\int x^2 \left( 1 - \frac{1}{x^2} \right) dx =$

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106. The value of  $a (a > 0)$  for which the area bounded by the curves  $y = \frac{x}{6} + \frac{1}{x^2}$ ,  $y = 0$ ,  $x = a$ , and  $x = 2a$  has the least value is\_\_

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107. Area bounded by the relation  $[2x] + [y] = 5$ ,  $x, y > 0$  is\_\_



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108. The area bounded by the curves  $y = x(x - 3)^2$  and  $y = x$  is \_\_\_\_\_  
(in sq. units)

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109. If the area of the region  $\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$  is  $A$ , then the value of  $3A - 17$  is \_\_\_\_\_

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110. The area enclosed by  $f(x) = 12 + ax - x^2$  coordinates axes and the ordinates at  $x = 3$  ( $f(3) > 0$ ) is 45 sq. units. If  $m$  and  $n$  are the x-axis intercepts of the graph of  $y = f(x)$ , then the value of  $(m + n + a)$  is \_\_\_\_\_

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111. If the area bounded by the curve  $f(x) = x^{\frac{1}{3}}(x - 1)$  and the x-axis is  $A$ , then the value of  $28A$  is \_\_\_

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112. If the area bounded by the curve  $y = x^2 + 1$  and the tangents to it drawn from the origin is  $A$ , then the value of  $3A$  is \_\_-

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113. If the area enclosed by the curve  $y = \sqrt{x}$  and  $x = -\sqrt{y}$ , the circle  $x^2 + y^2 = 2$  above the x-axis is  $A$ , then the value of  $\frac{16}{\pi}A$  is \_\_\_

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114. Which of the following abnormalities is due to X-linked recessive mutation ?

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115. If  $A$  is the area bounded by the curves  $y = \sqrt{1 - x^2}$  and  $y = x^3 - x$ , then of  $\frac{\pi}{A}$ .

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116. A curve is given by  $y = \left\{ \left( \sqrt{4 - x^2} \right), 0 \leq x < 1 \text{ and } \sqrt{(3x)}, 1 \leq x \leq 3 \right\}$ . Find the area lying between the curve and x-axis.

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117. Find the area enclosed by the curves  $x^2 = y$ ,  $y = x + 2$  and x-axis





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**118.** 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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**119.** Find the area of that part of the circle  $x^2 + y^2 = 16$  which is exterior to the parabola  $y^2 = 6x$ .



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**120.** Find the area bounded by the y-axis,  $y = \cos x$ , and  $y = \sin x$  when  $0 \leq x \leq \frac{\pi}{2}$ .



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**121.** Find the area lying in the first quadrant and bounded by the curve  $y = x^3$  and the line  $y = 4x$ .

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**122.** If the area enclosed by curve  $y = f(x)$  and  $y = x^2 + 2$  between the abscissa  $x = 2$  and  $x = \alpha$ ,  $\alpha > 2$ , is  $(\alpha^3 - 4\alpha^2 + 8)$  sq. unit. It is known that curve  $y = f(x)$  lies below the parabola  $y = x^2 + 2$ .

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**123.** Plot the region in the first quadrant in which points are nearer to the origin than to the line  $x = 3$ .

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**124.** Find the area bounded by the curve  $y = \sin^{-1} x$  and the line  $x = 0, |y| = \frac{\pi}{2}$ .

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**125.** Find the area of the region bounded by the limits  $x = 0, x = \frac{\pi}{2}$ , and  $f(x) = \sin x, g(x) = \cos x$ .

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**126.** The area bounded by  $y = \sec^{-1} x, y = \cos ec^{-1} x$ , and line  $x - 1 = 0$  is (a)  $\log(3 + 2\sqrt{2}) - \frac{\pi}{2}$  sq. units (b)  $\frac{\pi}{2} - \log(3 + 2\sqrt{2})$  sq. units (c)  $\pi - (\log)_e 3$  sq. units (d) non of these

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127. The area of the region whose boundaries are defined by the curves  $y =$

$2 \cos x$ ,  $y = 3 \tan x$  and the  $y$ -axis is (a)  $1 + 31n \left( \frac{2}{\sqrt{3}} \right) \text{sq units}$  (b)

$1 + \frac{3}{2} 1n3 - 31n2 \text{sq units}$  (c)  $1 + \frac{3}{2} 1n3 - 1n2 \text{sq units}$  (d)

$1n3 - 1n2 \text{sq units}$

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128. A particle of mass  $m$  is moving anticlockwise, in a circle of radius  $R$  in  $x - y$  plane with centre at  $(R, 0)$  with a constant speed  $v_2$ . It is located at point  $(2R, 0)$  at time  $t = 0$ . A man starts moving with a velocity  $v_1$  along the positive  $y$ -axis from origin at  $t = 0$ . Calculate the linear momentum of the particle w.r.t. man as a function of time.

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129. The area of the closed figure bounded by  $x = -1$ ,  $y = 0$ ,  $y = x^2 + x + 1$ , and the tangent to the curve

$y = x^2 + x + 1$  at  $A(1, 3)$  is (a)  $\frac{4}{3}$  sq. units (b)  $\frac{7}{3}$  sq. units (c)  $\frac{7}{6}$  sq.

units (d) non of these

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**130.** The area of the closed figure bounded by  $y = \frac{x^2}{2} - 2x + 2$  and the tangents to it at  $\left(1, \frac{1}{2}\right)$  and  $(4, 2)$  is (A)  $\frac{9}{8}$  sq.unit (B)  $\frac{3}{8}$  sq.units (C)  $\frac{3}{2}$  sq.units (D)  $\frac{9}{4}$  sq.units

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**131.** The area of the closed figure bounded by  $x = -1$ ,  $x = 2$ , and  $y = \begin{cases} -x^2 + 2, & x \leq 1 \\ 2x - 1, & x > 1 \end{cases}$  and the ascissa axis is (a)  $\frac{16}{3}$  squnits (b)  $\frac{10}{3}$  squnits (c)  $\frac{13}{3}$  squnits (d)  $\frac{7}{3}$  squnits

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**132.** 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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**133.** The area bounded by the curve  $a^2y = x^2(x + a)$  and the x-axis is  $\frac{a^2}{3}$  sq units (b)  $\frac{a^2}{4}$  sq units  $\frac{3a^2}{4}$  sq units (d)  $\frac{a^2}{12}$  sq units



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**134.** Find the area bounded by the curve  $x^2 = 4y$  and the straight line  $x = 4y - 2$ .



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135. If  $S$  is the sum of cubes of possible value of  $c$  for which the area of the figure bounded by the curve  $y = 8x^2 - x^5$ , then straight lines  $x = 1$  and  $x = c$  and the abscissa axis is equal to  $\frac{16}{3}$ , then the value of  $[S]$ , where  $[.]$  denotest the greatest integer function, is \_\_\_

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136. The area of the smaller region bounded by circle  $x^2 + y^2 = 1$  and  $|y| = x + 1$  (a)  $\frac{\pi}{2} - \frac{1}{2}$  sq units (b)  $\frac{\pi}{2} - 1$  sq units (c)  $\frac{\pi}{2}$  sq units (d)  $\frac{\pi}{2} + 1$  sq units

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137.  $\int \frac{e^{2x} - 1}{e^{2x} + 1} dx$  is eual to -

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**138.** Sketch the region bounded by the curves  $y = \sqrt{5 - x^2}$  and  $y = |x - 1|$  and find its area.

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

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

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141. Given  $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ ,  $B^{-1} = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ . Compute  $(AB)^{-1}$ .



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142. 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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