

8. APPLICATION OF INTEGRALS

- Find the area enclosed by the circle $x^2 + y^2 = a^2$.
- Find the area of the region enclosed between the two circles $x^2 + y^2 = 4$ and $(x-2)^2 + y^2 = 4$. [CBSE 2010, 2012]
- Find the area of the region in the first quadrant enclosed by the x - axis, line $x = \sqrt{3}y$ and the circle $x^2 + y^2 = 4$.
- Find the area of the smaller part of the circle $x^2 + y^2 = a^2$ cut off by the line $x = \frac{a}{\sqrt{2}}$.
- Find the area of the region in the first quadrant enclosed by the x - axis, the line $y = x$, and the circle $x^2 + y^2 = 32$. [CBSE 2014]
- Find the area lying above x - axis and included between the circle $x^2 + y^2 = 8x$ and inside of the parabola $y^2 = 4x$.
- Find the area of the circle $4x^2 + 4y^2 = 9$ which is interior to the parabola $x^2 = 4y$. [CBSE 2010]
- Find the area of the region $\{(x, y) : y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$.
- Find the area of the region enclosed between the two circles $x^2 + y^2 = 1$ and $(x-1)^2 + y^2 = 1$. [CBSE 2007]
- Find the area common to the circle $x^2 + y^2 = 16a^2$ and the parabola $y^2 = 6ax$. [CBSE 2004, 2012]
- Find the area of the circle $x^2 + y^2 = 16$ which is exterior to the parabola $y^2 = 6x$. [CBSE 2007]
- Find the area of the region $\{(x, y) : x^2 + y^2 \leq 4, x^2 \geq 2\}$. [CBSE 2012]
- Using integration, find the area of the region: $\{(x, y) : |x-1| \leq y \leq \sqrt{5-x^2}\}$. [CBSE 2010]
- Find the area of the region in the first quadrant enclosed by x - axis, the line $y = \sqrt{3}x$ and the circle $x^2 + y^2 = 16$. [2012]
- Find the area of the region in the first quadrant enclosed by x - axis, the line $x = \sqrt{3}y$ and the circle $x^2 + y^2 = 4$. [CBSE 2012]
- Find the area of the region enclosed between the two curves $x^2 + y^2 = 9$ and $(x-3)^2 + y^2 = 9$. [CBSE 2009]
- Find the area of the region $\{(x, y) : x^2 + y^2 \leq 1 \leq x + y\}$ [CBSE 2010]
- Find the area of the region bounded by the curve $y = \sqrt{1-x^2}$, line $y = x$ and the positive x - axis.
- Find the area of the region bounded by the curve $y = x$ and the line $y = 4$.
- Find the area of the region bounded by the curve $y^2 = x$ and the lines $x = 1$, $x = 4$ and the x - axis.
- The area between $x = y^2$ and $x = 4$ is divided into two equal parts by the line $x = a$, find the value of a .
- Find the area of the region bounded by $y^2 = 9x$, $x = 2$, $x = 4$ and the x - axis in the first quadrant.
- Find the area of the region bounded by $x^2 = 4y$, $y = 2$, $y = 4$ and the y - axis in the first quadrant.
- Find the area of the region bounded by the parabola $y = x^2$ and $y = |x|$.
- Find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$. [CBSE 2004, 2005, 2010]
- Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.
- Find the area bounded by the curves $(x-1)^2 + y^2 = 1$ and $x^2 + y^2 = 1$.

28. Find the area of the region bounded by the curves $y = x^2 + 2$, $y = x$, $x = 0$ and $x = 3$.
29. Find the area of the region $\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$
30. Find the area between the curves $y = x$ and $y = x^2$.
31. Find the area under the given curves and the given lines:
(a) $y = x^2$, $x = 1$, $x = 2$ and x - axis.
(b) $y = x^4$, $x = 1$, $x = 5$ and x - axis.
32. Find the area of the region lying in the first quadrant and bounded by $y = 4x^2$, $x = 0$, $y = 1$, $y = 4$.
33. Find the area bounded by the curves $\{(x, y) : y \geq x^2, y \leq x\}$ [CBSE 2002, 2012]
34. Find the area of the region $\{(x, y) : y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$.
35. Find the area of the region enclosed by the parabola $x^2 = y$, the line $y = x + 2$ and the x - axis.
36. Find the area enclosed by the parabola $4y = 3x^2$ and the line $2y = 3x + 12$.
37. Find the area enclosed between the parabola $y^2 = 4ax$ and the line $y = mx$.
38. Find the area of the parabola $y^2 = 4ax$ bounded by its latus rectum.
39. Find the area of the region bounded by the two parabolas $y = x^2$ and $y^2 = x$.
40. Find the area of the region included between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, where $a > 0$. [CBSE 2003, 2004]
41. Find the area of the region $\{(x, y) : x^2 \leq y \leq x\}$ [CBSE 2005, 2011]
42. Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
43. Find the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the ordinates $x = 0$ and $x = ae$, where $b^2 = a^2(1 - e^2)$ and $e < 1$.
44. Find the area of the region bounded by the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.
45. Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.
46. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $\frac{x}{3} + \frac{y}{2} = 1$. [CBSE 2014]
47. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the line $\frac{x}{a} + \frac{y}{b} = 1$.
48. Draw a rough sketch of the graph of the curve $\frac{x^2}{4} + \frac{y^2}{9} = 1$, evaluate the area of the region under the curve and above the x - axis.
49. Find the area of the region bounded by the line $y = 3x + 2$, the x - axis and the ordinates $x = -1$ and $x = 1$.
50. Find the area bounded by the line $y = 4x + 5$, $y = 5 - x$ and $4y = x + 5$. [CBSE 2005]
51. Using integration, find the area of the following regions:
 $\left\{ (x, y) : \frac{x^2}{9} + \frac{y^2}{4} \leq 1 \leq \frac{x}{3} + \frac{y}{2} \right\}$ [CBSE 2010]
52. Using integration, find the area of region bounded by the triangle whose vertices are $(-1, 0)$, $(1, 3)$ and $(3, 2)$.
53. Using integration, find the area of the triangular region whose sides have the equation $y = 2x + 1$, $y = 3x + 1$ and $x = 4$.
54. Using integration, find the area of region bounded by the triangle whose vertices are $(1, 0)$, $(2, 2)$ and $(3, 1)$.
55. Using the method of integration, find the area of the region bounded by the ΔABC , coordinates of whose vertices are A $(2, 0)$, B $(4, 5)$ and C $(6, 3)$.

56. Using the method of integration, find the area of the region bounded by the ΔABC , coordinates of whose vertices are A (2, 5), B (4, 7) and C (6, 2). [CBSE 2010, 2011]
57. Using the method of integration, find the area of the region bounded by the ΔABC , coordinates of whose vertices A, B, C are A (-1, 1), B (0, 5) and C (3, 2) respectively. [CBSE 2008]
58. Using integration, find the area of the triangular region, the equation of whose sides are $y = 2x + 1$, $y = 3x + 1$ and $x = 4$. [CBSE 2011, 2012]
59. Using integration, find the area of the region $\{(x, y) : x^2 + y^2 \leq 16, x^2 \leq 6y\}$.
60. Using the method of integration, find the area bounded by the curve $|x| + |y| = 1$.
61. Using the method of integration, find the area of the region bounded by the lines $2x + y = 4$, $3x - 2y = 6$ and $x - 3y + 5 = 0$.
62. Using integration, Find the area of the region bounded by the lines $y = 2 + x$, $Y = 2 - x$ and $x = 2$. [2015]
63. Using integration, find the area of the region bounded by the line $y - 1 = x$, the x - axis and the ordinates $x = -2$ and $x = 3$. [CBSE 2002]
64. Using the method of integration, find the area of the region bounded by the following lines:
 $3x - y - 3 = 0$, $2x + y - 12 = 0$, $x - 2y - 1 = 0$ [CBSE 2012]
65. Find the area bounded by the curve $y = \sin x$ between $x = 0$ and $x = 2\pi$.
66. Sketch the region bounded by the curves $y = \sqrt{5 - x^2}$ and $y = |x - 1|$ and find its area using integration. [2015]
67. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$, divides the area of the square bounded by $x = 0$, $x = 4$, $y = 4$ and $y = 0$ into three equal parts. [CBSE 2009]
68. Sketch the graph of $y = |x + 3|$ and evaluate $\int_{-6}^0 |x + 3| dx$. What does this integer represent on the graph? [CBSE 2011]
69. Sketch the graph of $y = |x - 5|$ and evaluate $\int_0^1 |x - 5| dx$. What does this value of integral represent on the graph?
70. Using integration, find the area bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$. [2015]