MATHS

NCERT - NCERT MATHEMATICS(ENGLISH)

APPLICATION OF INTEGRALS

Miscellaneous Exercise

1. The area of the circle $x^2 + y^2 = 16$exterior to the parabola $y^2 = 6x$is(A) $\frac{4}{3}\left(4\pi - \sqrt{3}\right)$ (B) $\frac{4}{3}\left(4\pi + \sqrt{3}\right)$(C) $\frac{4}{3}\left(8\pi - \sqrt{3}\right)$ (D) $\frac{4}{3}\left(8\pi + \sqrt{3}\right)$

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2. Using the method of integration find the area bounded by the curve $|x| + |y| = 1$.[Hint: The required region is bounded by lines $x + y = 1, x - y = 1, -x + y = 1$and $-x - y = 1]$.

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3. Find the area of region by the curve $y = \sin x$ between $x = 0$ and $x = 2\pi$.

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4. Using the method of integration find the area of the triangle ABC, coordinates of whose vertices are A(2, 0), B (4, 5) and C (6, 3).

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

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6. Find the area of the region lying in the first quadrant and bounded by $y = 4x^2$, $x = 0, y = 1 and y = 4.$

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7. Find the area bounded by curves $\{(x, y) : y \geq x^2 \text{ and } y = |x|\}$

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

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9. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $\frac{x}{3} + \frac{y}{2} = 1.$

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10. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the straight line $\frac{x}{a}+\frac{y}{b}=1.$

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11. Sketch the graph $y=|x+3|\cdot$ Evaluate $\int_{-6}^{0}|x+3|dx\cdot$ What does the value of this integral represent on the graph?

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12. Find the area of the region enclosed by the parabola $y^2 = 4ax \; and$ the line $y = mx$.

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13. Find the area enclosed by the parabola $4y = 3x^2$ and the line $2y = 3x + 12$.

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14. Find the area under the given curves and given lines:(i) $y = x^2, x = 1, x = 2$and x-axis(ii) $y = x^4,$

$x = 1, x = 5$and x-axis

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15. the area between the curves $y = x^2$ and $y = 4x$ is

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16. Using the method of integration find the area of the region bounded by lines: $2x + y = 4, 3x - 2y = 6$and $x - 3y + 5 = 0$

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17. Find the area of the region enclosed by the parabola $x^2 = y$, the line $y = x + 2$ and the X-axis.

A. $\frac{3}{2}$

B. $\frac{7}{2}$

C. $\frac{9}{2}$

D. $\frac{5}{2}$

Answer: C

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18. The area bounded by the curve $y = x|x|$, x-axis and the ordinates $x = -1$ and $x = 1$ is given by (A) 0 (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{4}{3}$ [Hint : $y = x^2$ if $x > 0$ and $y = -x^2$ if $x < 0$].

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19. The area bounded by the y-axis, $y = \cos x$and $y = \sin x$ when $0 \leq x \leq \frac{\pi}{2}$is(A) $2\left(\sqrt{2-1}\right)$ (B) $\sqrt{2} - 1$ (C) $\sqrt{2} + 1$ (D) $\sqrt{2}$

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Solved Examples

1. Find the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and the ordinates $x=ae\ and\ x=0,$ where $b^2=a^2\left(1-e^2\right) and\ e<1.$

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2. Find the area of the region in the first quadrant enclosed by the y-axis, the line $y=x$ and the circle $x^2+y^2=32,$ using integration.

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3. 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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4. Find the area of the region bounded by the two parabolas $y = x^2$ and $y^2 = x$.

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5. Find the area enclosed by the circle $x^2 + y^2 = a^2$.

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

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7. Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

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8. Using integration find the area of region bounded by the triangle whose vertices are (1, 0), (2, 2) and (3, 1).

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9. In Figure, AOBA is the part of the ellipse $9x^2 + y^2 = 36$in the first quadrant such that $OA = 2 and OB = 6$. Find the area between the arc AB and the chord AB.

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10. Find the area bounded by the curve $y = \cos x$ between $x = 0$and $x = 2\pi$.

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

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12. Find the area of the region $\{(x, y): 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$

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13. Find the area of the region bounded by the line $y = 3x + 2$, the x-axis and the ordinates $x = 1 and dx = 1.$

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14. Using integration, find the area of the region enclosed between the two circles $x^2 + y^2 = 4$ and

$(x-2)^2+y^2=4.$

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15. Find the area of the parabola $y^2=4ax$ bounded by its latus rectum.

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Exercise 8 1

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

A. $a^4\left[\frac{\pi}{5}-\frac{1}{3}\right]$

B. $a^2\left[\frac{\pi}{4}-\frac{1}{2}\right]$

C. $a^2\left[\frac{\pi}{3}-\frac{1}{4}\right]$

D. $a^3\left[\frac{\pi}{3}-\frac{1}{2}\right]$

Answer: B

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2. 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.

A. $a = 7^{\frac{2}{3}}$

B. $a = 2^{\frac{2}{3}}$

C. $a = 5^{\frac{2}{3}}$

D. $a = 4^{\frac{2}{3}}$

Answer: D

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3. Find the area of the region bounded by the parabola $y = x^2$ and $y = |x|$.

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4. 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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5. Find the area of the region bounded by $y^2 = 9x, x = 2, x = 4$and the x-axis in the first quadrant.

A. $16 - 4\sqrt{2}$

B. $15 - 4\sqrt{5}$

C. $17 - 4\sqrt{3}$

D. $18 - 4\sqrt{7}$

Answer: A

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6. Find the area of the region bounded by $x^2 = 4y$, $y = 2, y = 4$and the y-axis in the first quadrant.

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7. Area of the region bounded by the curve $y^2 = 4x$, y-axis and the line $y = 3$ is 2 b. $\frac{9}{4}$ c. $\frac{9}{3}$ d. $\frac{9}{2}$

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8. Find the area of the region bounded by the curve $y^2 = x$and the lines $x = 1, x = 4$and the x-axis.

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9. Prove that the area in the first quadrant enclosed by the axis, the line $x = \sqrt{3}y$ and the circle $x^2 + y^2 = 4\, is\, \pi/3.$

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

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

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12. Find area enclosed by ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

A. 10π

B. 11π

C. 12π

D. 13π

Answer: C

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13. Find the area of the region bounded by the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

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Exercise 8 2

1. 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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2. Find the area bounded by the curve $(x-1)^2 + y^2 = 1$ and $x^2 + y^2 = 1$.

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3. Find the area of the circle $4x^2 + 4y^2 = 9$ which is interior to the parabola $x^2 = 4y$.

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4. 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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5. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line $x + y = 2$ is (A) $2(\pi - 2)$ (B) $\pi - 2$ (C) $2\pi - 1$ (D) $2(\pi + 2)$

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6. Using integration find the area of the triangular region whose sides have the equations$y = 2x + 1$, $y = 3x + 1$and $x = 4$.

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7. Using integration find the area of region bounded by the triangle whose vertices are $(1, 0), (1, 3)and(3, 2)$.

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