(1) Find the area of the region bounded by the circle $x^2 + y^2 = r^2$.

[Ans: πr^2]

(2) Find the area of the region bounded by $y = x^2 - 5x + 4$ and X-axis.

$\left[\text{Ans} : \frac{9}{2} \right]$

(3) Find the area of the region enclosed by $y^2 = 8x$ and $x + y = 0$.

$\left[\text{Ans} : \frac{32}{3} \right]$

(4) Find the area of the region between the circles, $x^2 + y^2 = 4$ and $x^2 + y^2 = 4x$.

$\left[\text{Ans} : \frac{8\pi}{3} - 2\sqrt{3} \right]$

(5) Prove that the area of the region bounded by $y = 4x - x^2$ and X-axis is $\frac{32}{3}$.

(6) Find the volume of the solid obtained by revolution of portion of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ on right hand semi plane of Y-axis about Y-axis.

$\left[\text{Ans} : \frac{4}{3} \pi a^2 b \right]$

(7) If the region bounded by $y^2 = 8x$ from its vertex to $x = 2$ is rotated about X-axis, find the volume of the solid generated.

[Ans: 16π]

(8) Prove that the volume of the solid generated by revolving the region bounded by $y = x^2 + 1$ and $y = 2x + 1$ about X-axis is $\frac{104\pi}{15}$.

(9) Find the volume of the right circular cone having semi-vertical angle α and radius of base equal to r.

[Ans : $\frac{1}{3}\pi r^3 \cot\alpha$]

(10) Line x = c divides the area of the region bounded by $y^2 = 4x$ and x = 16 in two regions having equal areas. Find c.

[Ans : $2^{\frac{10}{3}}$]

(11) Find the area of the region bounded by $y = x^2$ and the line y = x + 2.

[Ans : $\frac{9}{2}$]

(12) Find the area of the region bounded by $y = 5x^2$ and $2x^2 - y + 9 = 0$.

[Ans: $12\sqrt{3}$]

(13) The region bounded by $y = 2x^2$, X-axis and x = 5 is rotated about Y-axis. Find the volume of the solid generated.

[Ans: 625π]

(14) Find the volume of the solid generated when the region bounded by $y = x^2$ and $y = 4x - x^2$ is rotated about X-axis.

[Ans : $\frac{32\pi}{3}$]

(15) If the region bounded by $x^2 - y^2 = a^2$, x = a and x = 2a is rotated about Y-axis, find the volume of the solid of revolution.

[Ans: $4\sqrt{3}\,\pi a^3$]

(16) Prove that the area of the region enclosed by the circle $x^2 + y^2 = 64$ and parabola $y^2 = 12x$ is $\frac{16}{3}(4\pi + \sqrt{3})$.

(17) Prove that the area of the region bounded by $x = 6 + 4y - y^2$ and $\overleftrightarrow{AB}$ where A is (4, 3) and B is (- 10, - 4) is 36.

(18) The region bounded by $y = 4x - x^2$, $x = 1$, $x = 3$ and X-axis is divided into two parts with equal area by $x = c$. Find c.

[Ans: 2]

(19) Obtain the area of the minor segment bounded by the circle $x^2 + y^2 = a^2$ and the line $x = \frac{a}{\sqrt{2}}$.

$\left[\text{Ans : } \frac{a^2}{4}(\pi - 2) \right]$

(20) Find the area of the region bounded by $y = x^2$ and $y = 2 - x$.

$\left[\text{Ans : } \frac{9}{2} \right]$

(21) Obtain the area of the region bounded by the line through A (3, 2) and B (1, 1) and the curve $x = y^2 + y - 1$.

$\left[\text{Ans : } \frac{1}{6} \right]$

(22) Obtain the area of the region bounded by the curve $y = x^2 + 1$ and the line passing through (0, 1) and (2, 5).

$\left[\text{Ans : } \frac{4}{3} \right]$

(23) Obtain the area of the region bounded by the curves $y^2 = 4x$ and $x^2 = 4y$.

$\left[\text{Ans : } \frac{16}{3} \right]$

(24) Obtain the area of the region bounded between the circle $x^2 + y^2 = 4$ and the parabola $y^2 = 3x$.

$\left[\text{Ans : } \frac{1}{3}(4\pi + \sqrt{3} \right]$

(25) Obtain the area of the region enclosed between the parabolas $y = 6x - x^2$ and $y = x^2 - 2x$.

$\left[\text{Ans : } \frac{64}{3} \right]$

(26) Obtain the volume of the solid surface generated on rotating the region bounded by the parabola $y = x^2$ and $y = 4x - x^2$, about the X-axis.

$\left[\text{Ans : } \frac{32\pi}{3} \right]$

(27) Show that the volume of the segment of a sphere with radius a between two parallel planes on one side of the centre at a distance r_1 and r_2 from the centre ($r_1 < r_2$) is $\frac{\pi}{3}(r_2 - r_1)[3a^2 - (r_1^2 + r_1 r_2 + r_2^2)]$.

(28) Obtain the area of the region enclosed between $y^2 = 4x - 4$ and $y^2 = -4x + 4$.

$\left[\text{Ans : } \frac{16}{3} \right]$

(29) Obtain area of the region enclosed between the parabola $y^2 = 4(x - 2)$, the line $y = x - 1$ and the X-axis.

$\left[\text{Ans : } \frac{2}{3} \right]$

(30) Find the volume of the solid generated on rotating the region bounded by the curve $y = x^2 + 1$ and the line $y = 2x + 4$, about the X-axis.

$\left[\text{Ans : } \frac{1408\pi}{15} \right]$

(31) Find the volume of the solid generated on rotating the region bounded by $y^2 = x^3$, $x = 2$ and the X-axis about the X-axis.

[Ans: 4π]

(32) Find the volume of the solid generated on rotating the region bounded by the curve $y = a\left(\sin x + \frac{\sin 3x}{3}\right)$, the X-axis and the lines $x = 0$ and $x = \pi$ about the X-axis.

$\left[\text{ Ans : } \frac{5\pi^2 a^2}{9}\right]$

(33) Find the common area enclosed between the ellipses $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ ($a > b$).

$\left[\text{ Ans : } 2ab\left(\pi - 2\sin^{-1}\frac{a}{\sqrt{a^2 + b^2}}\right)\right]$