

4.1 Area under curves

1. Find the area bounded by the curve $y = x^2 - x + 1$, the X-axis and the ordinates at $x = 1$, $x = 3$.
2. Find the area enclosed by the curve $y = \frac{1}{x}$, the x-axis and the ordinates at $x = a$ and $x = b$.
3. Find the area included between the curve $y = \cos x$, the x-axis and the ordinates at $x = 0$ and $x = \frac{\pi}{2}$.
4. Find the area bounded by the curve $y = x + \sin x$, the x-axis and the ordinates at $x = 0$ and $x = \frac{\pi}{2}$.
5. Find the area enclosed between the parabola $y = x^2 - x - 2$ and the x-axis.
6. Find the area bounded by the curve $y = x^2 + x$ and the x-axis.
7. Find the area included between one arch of the curve $y = \sin x$ and the x-axis.
8. Find the area enclosed between one arch of the curve $y = \sin 3x$ and the x-axis.
9. Find the area bounded by $y = x^2$ and $y = 3x$.
10. Find the area bounded by $y = x^2$ and $y = x + 2$.
11. Find the area enclosed between $y = x^2$ and the straight line $y = 3x + 4$.
12. Find the area enclosed between the curve $y = x^2$ and the line $2x + y - 3 = 0$.
13. Obtain the area bounded between the line $2x + y = 1$ and the curve $y = x^2 - 6x + 4$.
14. Find the area enclosed between the curves $y^2 = x$ and $x^2 = y$.
15. Find the area enclosed between the curves $y^2 = 4x$ and $x^2 = 4y$.
16. Find the area enclosed between the curves $y^2 = 4ax$ and $x^2 = 4ay$.
17. Obtain the area of the quadrant of a circle of radius r unit, using integration.
18. Find the area of a circle of radius r unit, using integration.

4.2 Volume of solids generated by rotation

1. Find the volume generated when the portion of the parabola $y^2 = 4x$ between $x=0$ and $x=4$ revolves about the x-axis.
2. Find the volume of the solid generated when the area bounded by the parabola $y = x^2$ and the ordinates at $x = 0$ and $x = 2$ is revolved about the X-axis.
3. Find the volume of the solid generated the rotation of the area bounded by the curve $y = 2x^2 + 1$, the Y-axis and the lines at $y = 3$ and $y = 9$ about the Y-axis.
4. Find the volume of the solid generated by rotating the area enclosed by the line $y = x$, the Y-axis and the abscissa at $y = 2$ and $y = 3$ about the Y-axis.

5. Find the volume of the solid generated by rotating the area enclosed by the line $x = 2y$, the Y – axis and the abscissa at $y = -1$ and $y = 2$ about the Y-axis.
6. Find the volume generated by the revolution of the area bounded by $y^2 = 4ax$, the x-axis and the ordinates at $x=0$ and $x=h$.
7. Find the volume of the solid obtained by rotating one arch of the curve $y = \sin x$ about the x-axis.
8. Find the volume got by rotating one arch of the curve $y = 2 \sin 3x$ about the X-axis.
9. Find the volume of a sphere of radius r using integration.
10. Show by integration that the volume of a right circular cone of height h and base radius r is $\frac{1}{3}\pi r^2 h$.

4.3 Differential Equations

1. Solve $\frac{dy}{dx} = \frac{x}{y}$
2. Solve $dx(1 + y^2) = dy(1 + x^2)$
3. Solve $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$
4. Solve $\frac{dy}{dx} + \frac{x\sqrt{1+y^2}}{y\sqrt{1+x^2}} = 0$
5. Solve $x(1 + y^2)dx + y(1 + x^2)dy = 0$
6. Solve $\frac{dy}{dx} = \frac{xy^2 + x}{yx^2 + y}$
7. Solve $\frac{dy}{dx} = e^{x+y} + x^2e^y$
8. Solve $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$
9. Solve $\frac{dy}{dx} + 3y = e^{2x}$
10. Solve $\frac{dy}{dx} + \frac{y}{x} = \frac{x^2}{2}$
11. Solve $x \frac{dy}{dx} + y = x^2$
12. Solve $x \frac{dy}{dx} + 3y = 5x^2$
13. Solve $(x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2$
14. Solve $\frac{dy}{dx} + y \tan x = \cos x$
15. Solve $\frac{dy}{dx} + y \tan x = \cos^2 x$
16. Solve $\frac{dy}{dx} + 2y \tan x = \sin x$
17. Solve $\frac{dy}{dx} + y \cot x = \cos ecx$
18. Solve $\frac{dy}{dx} + 2y \cot x = 3x^2 \cos ec^2 x$
19. Solve $\frac{dy}{dx} + y \cot x = 2 \cos x$
20. Solve $\sin x \frac{dy}{dx} + y \cos x = x \sin x$
21. Solve $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$
22. Solve $\frac{d^2 y}{dx^2} = \sin x$
23. Solve $\frac{d^2 y}{dx^2} = \sec^2 x$
24. Solve $\frac{d^2 y}{dx^2} = xe^x + \cos x$