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CLASS: XII: Mathematics

Definite Integrals, Area under the Curve and Differential Equations:

1. Evaluate : $\int_0^{\pi} \frac{x\,sinx}{1+cos^2x}\,dx$
2. Evaluate : $\int_0^{\pi} \frac{x}{a^2cos^2x+b^2sin^2x}\,dx$
3. Show that $\int_0^{\pi}(\sqrt{tanx}+\sqrt{cotx})dx = \sqrt{2\pi}$.
4. Evaluate : $\int_0^{\pi} \frac{x\,tanx}{secx\,cosecx}\,dx$
5. Evaluate : $\int_0^{\pi} \frac{x\,tanx}{secx+tanx}\,dx$
6. Evaluate: $\int_0^{\frac{\pi}{4}} \frac{sinx+cosx}{9+16sin2x}\,dx$
7. Evaluate: $\int_0^5(|x-2|)+|x-3|+|x-5|)dx$
8. Evaluate : $\int_0^{\frac{\pi}{2}} logsinx\,dx$
9. Evaluate : $\int_1^3(3x^2+2x)\,dx$ as limit of a sum
10. Evaluate: $\int_0^{\frac{3}{2}}(|xcos\pi x|))dx$
11. Using integration, find the area of the region bounded by the parabola $y^2 = 4x$ and the circle $4x^2 + 4y^2 = 9$.
12. Find the area bounded by the lines $x + 2y = 2$, $y – x = 1$ and $2x + y = 7$.
13. Find the area of the region enclosed between the two circles: $X^2 + y^2 = 4$, $(x-2)^2 + y^2 = 4$
14. Using the method of integration find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y – 2$.
15. Find the area of the region enclosed between the two circles: $X^2 + y^2 = 4$, $(x-2)^2 + y^2 = 4$
16. Using integration, find the area of the region bounded by the parabola $y = x^2$ and y = I x I.
17. Using integration, find the area of the region: $\{(x, y): x^2 + y^2 \le 16a^2$ and $y^2 \le 6ax\}$.
18. Using integration, find the area of the region: $\{(x, y): 4x^2 + 4y^2 \le 9$and $y^2 \le 4x\}$.using method of integration.
19. Find the area of the region included between the parabola $4y = 3x^2$ and the line $2y = 3x + 12$
20. Find the area of the region included between the parabola $y^2 = 2x$ and the line $y – x = 4$.

21. Using integration, find the area of the region:
{(x, y):4 x^2 +4 y^2 ≤ 9and 4y^2 ≤ 9}.

22. Find the particular solution of the differential equation :
$(\tan^{-1} y - x)\, dy = (1 + y^2)dx$, given that x = 0, y = 0.

23. Show that the differential equation $\left[x\, sin^2\left(\frac{y}{x}\right) - y\right] dx + xdy = 0$ is homogeneous.
Find the particular solution of this differential equation, given that x= 1 and y = $\frac{\pi}{4}$.

24. Find the particular solution of the differential equation :
$\frac{dy}{dx} + x \cot y = 2y + y^2 \cot y$, y≠0, given that x = 0 and y = $\frac{\pi}{2}$.

25. Prove that the differential equation $x^2 \frac{dy}{dx} - xy = 1 + \cos\frac{y}{x}, x \neq 0$ is homogeneous.
Find the particular solution of this differential equation, given that x = 1 and y = $\frac{\pi}{2}$.

26. Show that the differential equation $(x - y)\frac{dy}{dx} = x + 2y$ is homogeneous and solve it.

27. Solve the differential equation : $\frac{dy}{dx}$ = 1 + x + y + xy , given that y = 0 when x = 1.

28. Find the particular solution of the differential equation : x(1+y^2) dx – y(1 + x^2)dy =0, given that y =1, x =0.

29. Find the particular solution of the differential equation :
$x\log(\frac{dy}{dx}) = 3x + 4y$, given that y =0, x =0

30. Show that the differential equation $x \frac{dy}{dx}\sin\left(\frac{y}{x}\right) + x - y \sin\frac{y}{x} = 0$ is homogeneous.
Find the particular solution of this differential equation, given that x = 1 and y = $\frac{\pi}{2}$.