

TOPIC: “DIFFERENTIAL EQUATIONS”

1. Determine the order and the degree of the differential equation $\frac{d^2y}{dx^2} = \sqrt[3]{1 - \left(\frac{dy}{dx}\right)^4}$

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2. Find the order and degree of the differential equation $\frac{d^2y}{dx^2} = \sqrt[3]{1 + \frac{dy}{dx}}$

3. State the order and degree of the differential equation $dy + \sqrt{1 + \frac{d^3y}{dx^3}} dx = 0$

4. Order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{\frac{7}{3}} = 7 \frac{d^2y}{dx^2}$ are respectively

(a) 2.3

(b) 3.2

(c) 7.2

(d) 3.7

5. Verify that $y = Ae^2 + Be^{-2a}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$

6. From the differential equation by eliminating the arbitrary constants A and B from the relation $y = A \cos(\log x) + B \sin(\log x)$.

7. Find the differential equation of family of parabolas with vertex at (h, 0) and the principal axis along the X-axis.

8. Verify $y \sec x = \tan x + c$ is a solution of $\frac{dy}{dx} + y \tan x = \sec x$.

9. From the differential equation by eliminating the arbitrary constant from the equation $y = c^2 + \frac{c}{x}$.

10. From the differential equation by eliminating the arbitrary constant 'a' from the relation $(x - a)^2 + y^2 = 1$.

11. From the differential equation by eliminating the arbitrary constants a and b from the relation

$$y = ae^{2x} + be^{-2x}.$$

12. From the differential equation by eliminating the arbitrary constants from the equation $y = a \cos(\log x) + b \sin(\log x)$.

13. From the differential equation by eliminating the arbitrary constants A and B from the relation $y = Ae^{-2x} + Be^{-2x}$.

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14. Solve the differential equation $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

15. Solve the differential equation $\frac{dy}{dx} = (9x + y + 2)^2$,

16. Find the particular solution of the differential equation $y(1 + \log x) \frac{dx}{dy} - x \log x = 0$, When $x=e$ and $y = e^2$

17. Solve the differential equation $y - x \frac{dy}{dx} = 0$

18. Solve the differential equation $\cos^2 x \frac{dy}{dx} + y = \tan x$.

19. Solve the following differential equation $x dy - y(1-y) dx$ also find the particular solution if $y=2$ when $x = -4$

20. Solve : $\frac{dy}{dx} = \cos(x+y)$.

21. Solve the differential equation $\frac{dy}{dx} = e^{x+y} + x^2 e^y$.

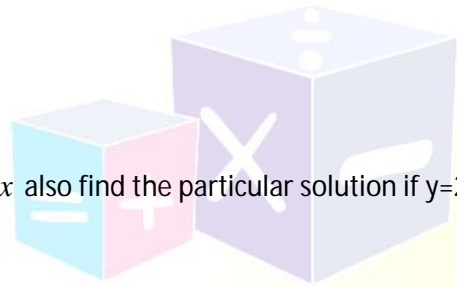
22. Show that $y = \cos(x+5)$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

23. Solve the differential equation $y \frac{dy}{dx} = \frac{x}{e^2}$

24. Solve the differential equation $x dy + 2y dx = 0$ when $x = 2$ & $y = 1$.

25. Solve the differential equation $\cos^2 y dx - \operatorname{cosec} x dy = 0$

26. Find the particular solution of the differential equation $(e^y + 1) \cos x dx + e^y \sin x dy = 0$, When $x = \frac{\pi}{4}$, $y = 0$.



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27. Solve : $\frac{dy}{dx} = \frac{x+y}{x-y}$

28. Solve : $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$

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29. Solve : $(1+e^{\frac{x}{y}})dx + e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy = 0$.

30. Solve : $\sin x \frac{dy}{dx} - y \log y$ also find the particular solution when $x = \frac{\pi}{2}$, $y = 1$.

31. Solve the differential equation $(x+y) \frac{dy}{dx} = a^2$.

32. Solve : $\left(y + x \frac{dy}{dx}\right) \sin(xy) = \cos x$.

33. Solve the differential equation $x^2 \frac{dy}{dx} = x^2 + xy + y^2$

34. Solve the differential equation $(1+y^2) \tan^{-1}x dx + 2y(1+x^2) dy = 0$.

35. Solve the differential equation $y - x \frac{dy}{dx} = 0$.

36. Solve the differential equation $(x+y) \frac{dy}{dx} = y$

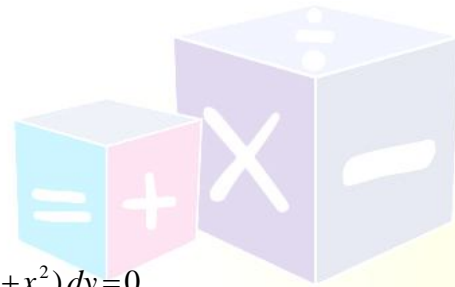
37. Solve the differential equation $e^x \tan^2 y dx + (e^x - 1) \sec^2 y dy = 0$

38. Solve the differential equation. $\frac{dy}{dx} = \frac{y + \sqrt{x^2 - y^2}}{x}$.

39. Verify that $y = ae^{-bx}$ is a solution of $\frac{d^2y}{dx^2} = \frac{1}{y} \left(\frac{dy}{dx}\right)^2$

40. Solve the differential equation $\frac{dy}{dx^2} = \frac{y}{x} + \tan\left(\frac{y}{x}\right)$.

41. Solve the differential equation $\frac{dy}{dx} = (4x + 3y - 1)^2$.



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42. Find the particular solution of the differential equation $\sec^2 y \tan x \, dy + \sec^2 x \tan y \, dx = 0$ when $x = y = \frac{\pi}{4}$.

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43. The slope of the tangent to the curve at any point is equal to $y + 2x$. Find the equation of the curve passing through the Origin.

44. The growth of a population is proportional to the number present. If the population of a colony doubles in 50 years, in how many years will the population become triple?

