

## TOPIC: DIFFERENTIAL EQUATIONS

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1. Write the degree of the differential equation

$$x^3 \left( \frac{d^2 y}{dx^2} \right)^2 + x \left( \frac{dy}{dx} \right)^4 = 0$$

2. Write the degree of the differential equation

$$\left( \frac{dy}{dx} \right)^4 + 3x \frac{d^2 y}{dx^2} = 0$$

3. Write the degree of the differential equation

$$\left( \frac{dy}{dx} \right)^4 + 3y \frac{d^2 y}{dx^2} = 0$$

4. Write of the differential equation of family of circles touching X – axis at the origin.

5. Write the differential equation representing family of ellipses having foci on X – axis and centre at the origin.

6. Form the differential equation representing family of curves given by

$$(x - a)^2 + 2y^2 = a^2 \text{ where, } a \text{ is an arbitrary constant.}$$

7. Write the differential equation of family of circles touching Y – axis at the origin.

8. Write the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

9. Write the differential equation representing the family of curves  $y = m x$ , where  $m$  is an arbitrary constant.

10. Solve the differential equation

$$x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x.$$

11. Find the general solution of the differential equation

$$(x - y) \frac{dy}{dx} = x + 2y.$$

12. Find the particular solution of the differential equation

$$\frac{dy}{dx} = 1 + x + y + xy, \text{ given that } y = 0 \text{ when } x = 1.$$

13. Find the particular solution of the differential equation

$$x \frac{dy}{dx} - y + x \operatorname{cosec} \left( \frac{y}{x} \right) = 0 \text{ given that } y = 0, \text{ when } x = 1.$$

14. Find a particular solution of the differential equation

$$\frac{dy}{dx} + 2y \tan x = \sin x,$$

$$\text{given that } y = 0, \text{ when } x = \frac{\pi}{3}$$

15. Solve the following differential equation

$$x \cos \left( \frac{y}{x} \right) \frac{dy}{dx} = y \cos \left( \frac{y}{x} \right) + x; \quad x \neq 0$$

16. If  $y(x)$  is a solution of the differential equation

$$\left( \frac{2 + \sin x}{1 + y} \right) \frac{dy}{dx} = -\cos x \text{ and } y(0) = 1,$$

$$\text{then find the value of } y \left( \frac{\pi}{2} \right)$$

17. Solve the differential equation

$$x \frac{dy}{dx} + y = x \cdot \cos x + \sin x,$$

$$\text{given } y \left( \frac{\pi}{2} \right) = 1$$

18. Solve the following differential equation

$$(1 + x^2) dy + 2xy dx = \cot x dx, \text{ where } x \neq 0.$$

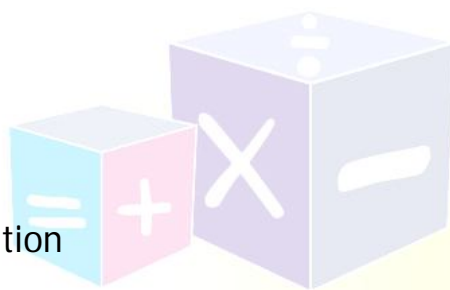
19. Find the particular solution of the differential equation

$$(1 + e^{2x}) dy + (1 + y^2) e^x dx = 0,$$

$$\text{Given that } y = 1 \text{ when } x = 0.$$

20. Solve the following differential equation

$$(1 + x^2) \frac{dy}{dx} + 2xy = \frac{1}{1 + x^2}, \text{ given that } y = 0, \text{ when } x = 1.$$



21. Solve the following differential equation

$$x dy - y dx = \sqrt{x^2 + y^2} dx$$

22. Solve the following differential equation

$$(y + 3x^2) \frac{dx}{dy} = x$$

23. Solve the following differential equation

$$(x^2 + 1) \frac{dy}{dx} + 2xy = \sqrt{x^2 + 4}$$

24. Solve the following differential equation

$$(x^3 + x^2 - x + 1) \frac{dy}{dx} = 2x^2 + x$$

25. Solve the following differential equation

$$\sqrt{1 + x^2 + y^2 + x^2 y^2} + xy \frac{dy}{dx} = 0$$

26. Find the particular solution of the differential equation satisfying the given condition

$$x^2 dy + (xy + y^2) dx = 0, \text{ when } y(1) = 1.$$

27. Find the particular solution of the differential equation

$$\frac{dx}{dy} + x \cot y = 2y + y^2 \cot y, \quad (y \neq 0), \text{ given that } x = 0, \text{ when } y = \frac{\pi}{2}$$

28. Show that the differential equation  $\left[ x \sin^2\left(\frac{y}{x}\right) - y \right] dx + x dy = 0$  is

homogeneous. Find the particular solution of this differential equation,

given that  $y = \frac{\pi}{4}$ , when  $x = 1$ .

29. Find the particular solution of the differential equation

$$(\tan^{-1} y - x) dy = (1 + y^2) dx, \text{ is given that } x = 0, \text{ when } y = 0.$$

30. Find the particular solution of the differential equation

$$\left\{ x \sin^2\left(\frac{y}{x}\right) - y \right\} dx + x dy = 0, \text{ given that } y = \frac{\pi}{4} \text{ when } x = 1.$$

31. Find the particular solution of the differential equation

$$\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}, \text{ given that } y = \frac{\pi}{2}, \text{ when } x = 1.$$

32. Solve the following differential equation

$$(x^2 - 1) \frac{dy}{dx} + 2xy = \frac{2}{x^2 - 1}$$

33. Find the particular solution of the differential equation

$$e^x \sqrt{1 - y^2} dx + \frac{y}{x} dy = 0,$$

given that  $y = 1$ , when  $x = 0$ .

34. Solve the following differential equation

$$\operatorname{cosec} x \log y \frac{dy}{dx} + x^2 y^2 = 0$$

35. Solve the following differential equation

$$(x^2 - y^2) dx + 2xy dy = 0, \text{ given that } y = 1, \text{ when } x = 1.$$

36. Solve the following differential equation

$$\frac{dy}{dx} = \frac{x(2y - x)}{x(2y + x)}, \text{ if } y = 1, \text{ when } x = 1.$$

37. Find the particular solution of the differential equation

$$(3xy + y^2) dx + (x^2 + xy) dy = 0, \text{ for } x = 1 \text{ and } y = 1.$$

38. Show that the differential equation  $2ye^{\frac{x}{y}} dx + (y - 2xe^{\frac{x}{y}}) dy = 0$  is

homogeneous. Find the particular solution of this differential equation, given that  $x = 0$ , when  $y = 1$ .

39. Show that the differential equation  $x \frac{dy}{dx} \sin\left(\frac{y}{x}\right) + x - y \sin\left(\frac{y}{x}\right) = 0$  is

homogeneous. Find the particular solution of this differential equation, given that  $x = 1$ , when  $y = \frac{\pi}{2}$ .

40. Find the particular solution of the differentiation equation

$$x(1 + y^2) dx - y(1 + x^2) dy = 0,$$

given that  $y = 1$ , when  $x = 0$ .

41. Find the particular solution of the differential equation

$$\log\left(\frac{dy}{dx}\right) = 3x + 4y \text{ equation, given that } y = 0, \text{ when } x = 0.$$

42. Solve the differential equation

$$(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$$

43. Solve the following differential equation

$$(x \log x) \frac{dy}{dx} + y = 2 \log x$$

44. Solve the following differential equation

$$x \frac{dy}{dx} = y - x \tan \frac{y}{x}$$

45. Solve the following differential equation

$$(1 + x^2) \frac{dy}{dx} + y = \tan^{-1} x$$

46. Solve the following differential equation

$$\frac{dy}{dx} + y = \cos x - \sin x$$

47. Solve the following differential equation

$$\frac{dy}{dx} + 2y \tan x = \sin x$$

48. Solve the following differential equation

$$x^2 \frac{dy}{dx} = y^2 + 2xy$$

49. Solve the differential equation

$$\frac{dy}{dx} + y \cot x = 2 \cos x,$$

given that  $y = 0$ , when  $x = \left(\frac{\pi}{2}\right)$ .

50. Solve the differential equation

$$(x^2 - yx^2) dy + (y^2 + x^2 y^2) dx = 0, \text{ Given that } y = 1.$$

51. Solve the following differential equation

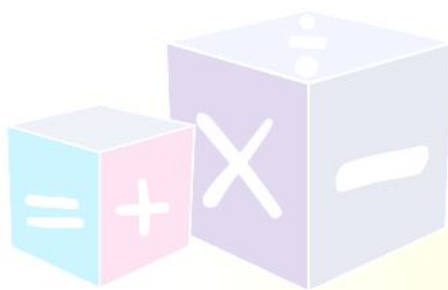
$$\frac{dy}{dx} + y \sec x = \tan x$$

52. Solve the following differential equation

$$2x^2 \frac{dy}{dx} - 2xy + y^2 = 0$$

53. Solve the following differential equation

$$\frac{dy}{dx} = 1 + x^2 + y^2 + x^2 y^2 = 0, \text{ given that } y = 1, \text{ when } x = 0.$$



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54. Solve the following differential equation

$$x(x^2 - 1)\frac{dy}{dx} = 1, y = 0, \text{ when } x = 2.$$

55. Find the particular solution of the differential equation satisfying the given

condition,  $\frac{dy}{dx} = y \tan x$ , given that  $y = 1$ , when  $x = 0$ .

56. Solve the following differential equation

$$\cos^2 x \frac{dy}{dx} + y = \tan x$$

57. Solve the following differential equation

$$\sec x \frac{dy}{dx} - y = \sin x$$

58. Solve the following differential equation

$$x dy - (y + 2x^2) dx = 0$$

59. Solve the following differential equation

$$x dy + (y - x^3) dx = 0$$

60. Solve the following differential equation

$$e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$$

61. Solve the following differential equation

$$(1 + y^2)(1 + \log x) dx + x dy = 0$$

62. Solve the following differential equation

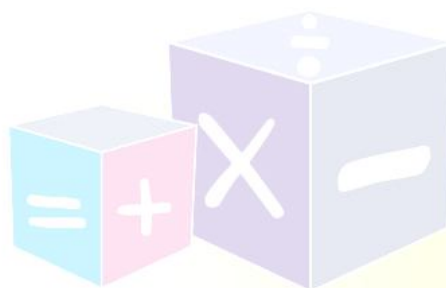
$$\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x \text{ given that } y = 0, \text{ when } x = \frac{\pi}{2}$$

63. Solve the following differential equation is homogeneous and then solve it.

$$y dx + x \log\left(\frac{y}{x}\right) dy - 2x dy = 0$$

64. Solve the following differential equation

$$\left(x \cos \frac{y}{x} + y \sin \frac{y}{x}\right) y - \left(y \sin \frac{y}{x} - x \cos \frac{y}{x}\right) x \frac{dy}{dx} = 0$$



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65. Solve the following differential equation

$$xy \log\left(\frac{y}{x}\right) dx + \left[ y^2 - x^2 \log\left(\frac{y}{x}\right) \right] dy = 0$$

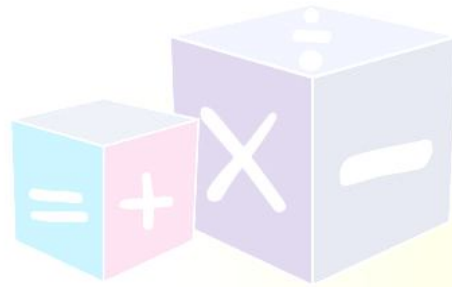
66. Solve the following differential equation

$$\left[ x \sin^2\left(\frac{y}{x}\right) - y \right] dx + x dy = 0$$

67. Solve the following differential equation

$$x \frac{dy}{dx} + y - x + xy \cot x = 0. \quad x \neq 0.$$

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