MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

DIFFERENTIAL EQUATIONS - FOR BOARDS

Solved Examples

1. Find the order and degree of the following differential equation: $\left(\frac{d^3y}{dx^3}\right)^2 - x\left(\frac{dy}{dx}\right)^3$.

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

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3. Determine the order and degree of each of the following differential equation. State also whether they are linear or non-linear: $y = px + \sqrt{a^2p^2 + b^2},\ where\ p = \frac{dy}{dx}$

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4. Find the order and degree of the differential equation $\frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right) = 0$

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5. Find the order and degree of the differential equation $\log_e\left(1+\frac{d^2y}{dx^2}\right)=x$

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6. The differential equation representing the family of curves $y^2=2c\left(x+\sqrt{c}\right)$, where c is a positive parameter, is of (a) order 1 (b) order 2 (c) degree 3 (d) degree 4

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7. Obtain the differential equation of the family of curves represented by $y=Ae^x+Be^{-x}+x^2$, where A and B are

arbitrary constants.

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8. From the differential equation of the family of curves $y = a\sin(x + b)$, where a and b are arbitrary constants.

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9. Form the differential equation representing the family of curves $y = A\cos(x + B)$ where AS and B are parameters.

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10. Find the differential equation of the family of curves $y = Ae^{x} + Be^{-x}$, where A and B are arbitrary constants.

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11. Form the differential equation corresponding to $y^2 = a(b - x)(b + x)$ by eliminating parameters $aandb$.

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12. Show that the differential equation of all parabolas $y^2 = 4a(x - b)$ is given by

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13. Form the differential equation corresponding to $y^2 = a(b-x)^2$,where a and b are arbitrary constant.

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14. Find the differential equation of the family of curves given by $x^2 + y^2 = 2ax$

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15. Form the differential equation representing the family of curves $y^2 - 2ay + x^2 = a^2$, where a is an arbitrary constant.

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16. Show that the differential equation representing one parameter family of curves $(x^2 - y^2) = c(x^2 + y^2)^2 is\ (x^3 - 3xy^2)dx = (y^3 - 3x^2y)dy$

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17. Form the differential equation of all concentric circles at the origin.

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18. Find the differential equation of the family of all straight lines passing through the origin.

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19. Form the differential equation representing the parabolas having vertex at the origin and axis along positive direction of x-axis.

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20. Form the differential equation of the family of circles touching the x-axis at origin.

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21. Form the differential equation of the family of circles in the second quadrant and touching the coordinate axes.

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22. Show that $y = ae^{2x} + be^{-x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} - 2y = 0.$

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23. Show that the function $y = (A + Bx)e^{3x}$ is a solution of the equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 0.$

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24. Verify that $y = ae^{3x} + be^{-x}$ is a solution of differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 0$

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25. Show that $y = Ax + \frac{B}{x}, x \neq 0$ is a solution of the differential equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0$

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26. Show that, $v = \frac{A}{r} + B$ satisfies the differential equation $\frac{d^2v}{dr^2} + \frac{2}{r}.\frac{dv}{dr} = 0$

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

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28. Solve the differential equation $\frac{dy}{dx} = \sqrt{4 - y^2}, \ -2 < y < 2$

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29. Solve the differential equation $(\sqrt{a+x})\frac{dy}{dx} + x = 0$

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30. Solve the differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$

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31. Solve the differential equation $\frac{dy}{dx} = \sin^{-1} x$

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32. Solve the following differential equation:

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

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33. Solve the following differential equation:

$\cos x(1 + \cos y)dx - \sin y(1 + \sin x)dy = 0$

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34. Solve the differential eqaution $x(1+y^2)dx - y(1+x^2)dy = 0,$ given that y=0 when x=1

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35. Solve the following differential equation: $x\cos y\, dy = (xe^x \log x + e^x)dx$

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36. Solve the differential equation $\frac{dy}{dx} = \log(x+1)$

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37. Solve the differential equation $\frac{dy}{dx} = \frac{e^x(\sin^2 x + \sin 2x)}{y(2\log y + 1)}$

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38. Solve the differential equation: $(1+y^2)(1+\log x)dx + xdy = 0$ given that when $x = 1,\ y = 1.$

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39. Solve: $(x+y)^2 \frac{dy}{dx} = a^2$

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40. Solve the differential equation $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

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41. Solve the following differential equation $(x^2 + xy)dy = (x^2 + y^2)dx$

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42. Solve the following differential equation: $2xydx + (x^2 + 2y^2)dy = 0$

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43. Solve the following differential equation: $(x^3 + y^3)dy - x^2ydx = 0)$

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44. Solve the following differential equation: $x^2\frac{dy}{dx} = x^2 - 2y^2 + xy$

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45. solve the differential equation $(y + x)\frac{dy}{dx} = y - x$

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46. Solve

$$\left\{x\cos\left(\frac{y}{x}\right)-x\cos\left(\frac{y}{x}\right)\right\}xdy=\left\{y\sin\left(\frac{y}{x}\right)-x\cos\left(\frac{y}{x}\right)\right\}$$

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47. Solve $\left(1+2e^{\frac{x}{y}}\right)dx+2e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy=0$

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48. Solve the following differential equation:

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

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49. Solve each of the following initial value problem:

$$2xy + y^2 - 2xy^2 \frac{dy}{dx} = 0, \; y(1) = 2$$

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50. Solve the differential equation $x\frac{dy}{dx} - y = x\tan\left(\frac{y}{x}\right)$, given $y = \frac{\pi}{2}$ when $x = 1$.

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51. Show that the family of curves for which the slope of the tangent at any point (x, y) on it is $\frac{x^2 + y^2}{2xy}$, is given by $x^2 \quad y^2 = \quad cx$.

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52. Solve the following differential equation: $x\frac{dy}{dx} - y = x^2$

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53. Solve the following differential equation: $x\frac{dy}{dx} - y - 2x^3 = 0$ i.e., $\frac{dy}{dx} - \frac{y}{x} = 2x^2$

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54. Solve the differential equation: $\frac{dy}{dx} + y\cot x = 2\cos x$

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55. Solve the following differential equation: $\frac{dy}{dx} + \sec x \cdot y = \tan x \left(0 \leq x < \frac{\pi}{2}\right)$

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56. Solve the following differential equation: $\frac{dy}{dx} + 2\tan x \cdot y = \sin x$ Also find the particular solution if $y = 0$ when $x = \frac{\pi}{3}$

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

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58. Solve the following differential equation :

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

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59. Solve the following differential equations:

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

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60. Solve the differential equation

$$\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right]\frac{dx}{dy}=1(x\neq 0)$$

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61. Solve the differential equation $x\frac{dy}{dx} + y - x + xy\cot x, x \neq 0$

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62. Solve the differential equation: $\frac{dy}{dx} + \frac{y}{x} = e^x, x > 0$

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63. Solve: $\frac{dy}{dx} - 2y = \cos 3x$

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64. Solve: $(x \log x)\frac{dy}{dx} + y = \frac{2}{x}\log x$

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65. Find the particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 2x + x^2 \cot x (x \neq 0)$ given that $y = 0$ when $x = \frac{\pi}{2}$.

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66. Solve the following differential equation, given that $y = 1$ when $x = 2$: $x\frac{dy}{dx} + y = x^3$

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67. Solve the differential equation $\frac{dy}{dx} - 3y \cot x = \sin 2x$ given $y = 2$ when $x = \frac{\pi}{2}$.

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68. The differential equations, find a particular solution satisfying the given condition:

$(1 + x^2)\frac{dy}{dx} + 2xy = \frac{1}{1 + x^2}; y = 0$when $x = 1$

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69. Find the particular solution of the differential equation.

$\frac{dy}{dx} + y \cot x = 4x \ \cos ec\, x, \ (x \neq 0),$ given that $y = 0$ when $x = \frac{\pi}{2}$.

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70. Solve : $\left(x+2y^3\right)\frac{dy}{dx}=y$

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71. Solve the following differential equation: $\left(1+y^2\right)dx=\left(\tan^{-1}y-x\right)dy$

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72. Solve the following differential equation: $\frac{dy}{dx}+\frac{1}{x}y=y^3$

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73. Solve the following differential equation:

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

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74. The Integrating Factor of the differential equation `(1-y^2)(dx)/(dy)+y x=a y(-1

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Exercise

1. Find the order and degree of $\frac{d^2y}{dx^2} + 4x = 0$ and also state whether its linear or non-linear.

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2. Find the order and degree of $3\frac{d^2y}{dx^2} - 5\left(\frac{dy}{dx}\right)^3 + 2y = 0$ and also state whether its linear or non-linear.

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3. Find the order and degree of $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}$ and also state whether its linear or non-linear.

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4. Find the order and degree of $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ and also state whether its linear or non-linear.

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5. Find the order and degree of $x^2\left(\frac{d^2y}{dx^2}\right)^3 + y\left(\frac{dy}{dx}\right)^4 + y^4 = 0$ and also state whether its linear or non-linear.

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6. Find the order and degree of $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$

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7. Determine order and degree (if defined) of differential equations given$y' + y = e^x$

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8. Determine order and degree (if defined) of differential equations given$y'' + 2y' + \sin y = 0$

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9. Find the order and degree of $\frac{dy}{dx} = e^x$

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10. Find the order and degree of $\frac{d^3y}{dx^3} + x^2\left(\frac{d^2y}{dx^2}\right)^3 = 0$

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11. Find the order and degree of $(x + y - 3)dx + (x^2 + 3x + y)dy = 0$ and also state whether they are linear or non-linear.

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12. Find the order and degree of $\frac{d^2y}{dx^2} = \sqrt[3]{1 + \left(\frac{dy}{dx}\right)^2}$ and also state whether they are linear or non-linear.

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13. Find the order and degree of $\frac{d^4y}{dx^4} = \left[c + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}$ and also state whether they are linear or non-linear.

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14. Find the order and degree of $\frac{d^3y}{dx^3} + \left(\frac{d^2y}{dx^2}\right)^3 + \frac{dy}{dx} + 4y = \sin x$ and also state whether they are linear or non-linear.

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15. Find the order and degree of $5\frac{d^2y}{dx^2} = \left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}$ and also state whether they are linear or non-linear.

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16. Determine order and degree (if defined) of differential equations given $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

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17. Find the order and degree of $\frac{d^3y}{dx^3} + 2\left(\frac{d^2y}{dx^2}\right)^2 - \frac{dy}{dx} + y = 0$

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18. Find the order and degree of $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$

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19. Find the order and degree of $y''' + y^2 + e^{y'} = 0$

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20. Find the order and degree of $\log\left(1 + \frac{dy}{dx}\right) = \frac{dy}{dx}$

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21. Find the order and degree of $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} = y\sin\left(\frac{d^2y}{dx^2}\right)$

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22. Find the order and degree of $\frac{d^3y}{dx^3} - 2\sin\left(\frac{d^3y}{dx^3}\right) = 0$

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23. Form a differential equation for the family of curves represented by $ax^2 + by^2 = 1$, where a and b are arbitrary constants.

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24. The differential equation obtained by eliminating the constants a and b from $xy = ae^{x} + be^{-x} + x^{2}$ is

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25. The differential equation satisfying all the curves $y = ae^{2x} + be^{-3x}$, where a and b are arbitrary constants, is

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26. If a is arbitrary constant, find the differential equation of $x^{2} + y^{2} = a^{2}$

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27. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$$y = ae^{3x} + be^{-2x}$$

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28. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$$\frac{x}{a} + \frac{y}{b} = 1$$

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29. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b.

$y = e^{2x}(a + bx)$

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30. if a, b are arbitrary constants, find the differential equation of $y = a\cos nx + b\sin nx$

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31. Find the differential equation of the family of curves $y = A\cos x + B\sin x$, where A, B are parameters.

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32. Form the differential equation of the family of curves represented by the equation (a being the parameter):

$(2x+a)^2+y^2=a^2$ $(2x-a)^2-y^2=a^2$

$(x-a)^2+2y^2=a^2$

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33. Find the differential equation of the family of curves $(x+a)^2-2y^2=a^2$, where a is an arbitrary constant.

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34. Form the differential equation representing the family of curves given by $(x-a)^2+2y^2=a^2$, where a is an arbitrary constant.

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35. Show that the differential equation of which $y=2(x^2-1)+ce^{-x}$ ^ 2 is a solution, is $\frac{dy}{dx}+2xy=4x^3$.

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36. Form the differential equation of simple harmonic motion given by $x=A\cos(nt+\alpha)$, where n is fixed and

A, α are parameters.

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37. Form the differential equation of the family of circles having centre on y-axis and radius 3 units.

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38. Form the differential equation of the family of hyperbolas having foci on x-axis and centre at origin.

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39. Find the differential equation of all the circles which pass thorough the origin and whose centres lie on x-axis.

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40. Obtain the differential equation of the family of circles passing through the point (a,0) and (-a,0).

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41. Verify that the function $y = e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

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42. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $y = e^x + 1 : y'' - y' = 0$

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43. Verify that the given function is a solution of the corresponding differential equation: $y = Ax : xy' = y(x \neq 0)$

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44. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation:

$y = \cos x + C : y' + \sin x = 0$

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45. In each of the following verify that the given function (explicit or implicit) is a solution of the corresponding differentia equation: $y = x \sin x$ ii. $y = \sqrt{a^2 - x^2}$

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46. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $xy = \log y + C : y' = \frac{y^2}{1 - xy} (xy \neq 1)$

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47. Verify that the given functions (explicit or implicit) is a solution of the corresponding differential equation: $x + y = \tan^{-1} y : y^2 y' + y^2 + 1 = 0$

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48. Verify that $y = 4\sin 3x$ is a solution of the differential equation $\frac{d^2y}{dx^2} + 9y = 0.$

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49. Show that the function $y = A\cos 2x + B\sin 2x$ is a solution of the differential equation $\frac{d^2y}{dx^2} + 4y = 0$

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50. Verify that the function $y = a \cos x + b \; s \in x$, where, a, $b \in R$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

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51. Show that the differential equation of which $y = 2(x^2 - 1) + ce^{-x}$ ^ 2 is a solution, is $\frac{dy}{dx} + 2xy = 4x^3$.

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52. Verify the solution problems: Show that $y = e^{-x} + ax + b$ is solution of the differential equation $e^x \frac{d^y}{dx^2} = 1$

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53. Verify that $y = e^x(a\cos x + c\sin x)$ is a solution of the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$

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54. Verify that $y = ce^{tan-1_x}$ is a solution of differential equation $(1 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0.$

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55. Verify that the function $y = c_1 eax \cos bx + c_2 eax \sin bx$, where c_1, c_2 are arbitrary constants is a solution of the differential equation. $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$

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56. Solve the following differential equation: $\frac{dy}{dx} = (e^x + 1)y$

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57. Solve the equation: $(1 + x^2)\tan^{-1} x \cdot \frac{dy}{dx} + y = 0$

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58. Solve the equation: $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$

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59. Solve the following differential equation: $\tan y\, dx + \sec^2 y \tan x\, dy = 0$

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60. Solve: $\left(x^2 - yx^2\right) dy + \left(y^2 + x^2 y^2\right) dx = 0$

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61. Solve the equation: $2\sin 3ydx + 3x\cos 3ydy = 0$

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62. Solve the equation: $(x+2)\frac{dy}{dx} = x^2 + 4x - 9$

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63. Solve the following differential equation: $\frac{dy}{dx} = \sin^3 x\cos^2 x + xe^x 2$

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64. Solve the equation: $\frac{dy}{dx} = \frac{1-\cos x}{1+\cos x}$

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65. Solve the equation: $\frac{dy}{dx} + y = 1, y \neq 1$

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66. Solve the equation: $(x+1)\frac{dy}{dx} = 2xy$

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67. Solve the equation: $e^x\sqrt{1-y^2}dx + \frac{y}{x}dy = 0$

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68. Solve the following differential equation:

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

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69. Solve $\frac{dy}{dx} = xy + x + y + 1$

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70. Solve: $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

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71. Solve the initial value problem $y' = y \cot 2x, y\left(\frac{\pi}{4}\right) = 2.$

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72. Solve the following differential equation: $xy(y+1)dy = \left(x^2 = 1\right)dx$

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73. Solve the following differential equation: $5\frac{dy}{dx} = e^x y^4$

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74. Solve: $\frac{dy}{dx} = \frac{1}{\sin^4 x + \cos^4 x}$ (ii) $\frac{dy}{dx} = \frac{3e^{2x} + 3e^{4x}}{e^x + e^{-x}}$

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75. $\sqrt{1+x^2}dy + \sqrt{1+y^2}dx = 0$

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76. $\frac{dy}{dx}\tan y = \sin(x+y) + \sin(x-y)$

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77. Solve the differential equation $x\left(x^2 - 1\right)\frac{dy}{dx} = 1$, given that when $x = 2, y = 0$.

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78. Find the solution of the differential equation $\cos y dy + \cos x \sin y dx = 0$ given that $y = \pi/2$, when $x = \pi/2$.

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79. Solve the differential equation $(x-1)\frac{dy}{dx} = 2xy$, given that $y(2) = 1$

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80. Find the particular solution of $\cos\left(\frac{dy}{dx}\right) = a$, given that $y = 2$ when $x = 0$

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81. Find the equation of the curve passing through the point (1, 1) whose differential equation is $xdy = \left(2x^2 + 1\right)dx(x \neq 0)$.

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82. The volume of spherical balloon being inflated changes at a constant rate. If initially its radius is 3 units and after 3

seconds it is 6 units. Find the radius of balloon after t seconds.

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83. Solve: $(x-y)^2 \frac{dy}{dx} = 1$

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

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85. Solve the equation $(x+y+1)\left(\frac{dy}{dx}\right) = 1$

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86. Solve the following differential equation: $\frac{dy}{dx} + 1 = e^{x+y}$

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

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88. Solve: $\left(x^2 + 2xy + y^2 + 1\right)\frac{dy}{dx} = 2(x+y)$

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89. Solve: $(x-y)^2 \frac{dy}{dx} = a^2$

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90. Solve the following differential equations: $(x+y)^2 \frac{dy}{dx} = 1$

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91. Solve: $x^2 dy + y(x+y)dx = 0$

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92. Solve the following differential equations: $\frac{dy}{dx} - \frac{y-x}{y+x}$

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93. $2xy\frac{dy}{dx} = x^2 + y^2$

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94. Solve: $xy\frac{dy}{dx} = x^2 - y^2$

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95. Solve the differential equation $(x+y)dy = (x-y)dx$

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96. Show that the differential equation $2xy\frac{dy}{dx} = x^2 + 3y^2$ is homogeneousand solve it.

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97. $\frac{dy}{dx} + \frac{x - 2y}{2x - y} = 0$

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

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99. Solve: $(x^2 + y^2)dx + 3xydy = 0$

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100. Solve $x\left(\frac{dy}{dx}\right) = y(\log y - \log x + 1)$

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101. Solve: $(x - y)\frac{dy}{dx} = x + 3y$

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102. $(x^3 + 3xy^2)dx + (y^3 + 3x^2y)dy = 0$

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103. Solve: $\left(x - \sqrt{xy}\right)dy = ydx$

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104. Solve the following differential equation: $x\frac{dy}{dx} - y = 2\sqrt{y^2 - x^2}$

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105. Solve: $y^2dx + \left(x^2 + xy + y^2\right)dy = 0$

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106. Solve the following differential equation:

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

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107. Solve the differential equation

$x^2dy+y(x+y)dx=0,$ given that $y=1\ when\ x=1.$

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108. Solve the differential equation

$(x+y)dy+(x-y)dx=0$; given that y = 1 when x = 1.

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109. Solve the differential equation : $\left(x\sin^2\left(\frac{y}{x}\right)-y\right)dx+xdy=0$ given $y=\frac{\pi}{4}$ when $x=1.$

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110. Solve the differential equation $\frac{dy}{dx}-\frac{y}{x}+\cos ec\frac{y}{x}=0,$ given that $y=0$ when $x=1$

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111. Solve: $x\cos x\frac{dy}{dx}+y(x\sin x+\cos x)=1$

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112. Solve: $\left(1-x^2\right)\frac{dy}{dx}-xy=x$

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113. Solve $\left(x^2+1\right)\frac{dy}{dx}+2xy=\sqrt{x^2+4}$

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114. Solve: $\frac{dy}{dx}+2y=e^{-x}$

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115. Solve the following differential equation: $4\frac{dy}{dx}+8y=5\,e^{-3x}$

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116. Solve the following differential equation : $\frac{dy}{dx} + 2y = 6e^x$

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117. Solve the following differential equation: $\frac{dy}{dx} + y = e^{-2x}$

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118. Solve the following differential equations: $x\frac{dy}{dx} = x + y$

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119. Solve: $\frac{dy}{dx} + 3y = e^{-2x}$

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120. Solve the each of the following differential equation:

$x\frac{dy}{dx} + 2y = x^2, \ x \neq 0$

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121. Solve: $\frac{dy}{dx} + y = \cos x$

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122. Solve: $\frac{dy}{dx} + y = e^x$

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123. Solve: $x\frac{dy}{dx} - y = x + 1$

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124. Solve: $\frac{dy}{dx} + y = \cos x - \sin x$

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125. Solve: $\frac{dy}{dx} + \frac{y}{x} = x^n$

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126. Solve: $\frac{dy}{dx} - y\tan x = e^x \sec x$

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127. Solve: $\left(1 + x^2\right)\frac{dy}{dx} + 2xy = \cos x$

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128. Solve: $(\sec x)\frac{dy}{dx} = y + \sin x$

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129. Solve: $\frac{dy}{dx} + y\cos x = \sin x \cos x$

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130. Solve: $\frac{dy}{dx} + 2y\cot x = 3x^2 \cos ec^2 x$

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

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132. Solve: $x\frac{dy}{dx} = y(\log y - \log x - 1)$

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133. $(1-x^2)\frac{dy}{dx}+xy=ax$

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134. Solve $\frac{dy}{dx}+y\cot x=2x+x^2\cot x$,given that y=0 when x=0

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135. Solve the equation $ydx+(x-y^2)dy=0$

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136. Solve: $\left(x+3y^2\right)\frac{dy}{dx}=y(y>0)$

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137. Solve: $\left(x-y^3\right)\frac{dy}{dx}+y=0$

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138. Solve: $\frac{dy}{dx}+x\sin 2y=x^3\cos^2 y$

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139. Solve $x\frac{dy}{dx}+y=y^2\ln x$

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140. Solve: $\frac{dy}{dx} = x^3y^3 - xy$

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