MATHS

BOOKS - PRADEEP PUBLICATION

DIFFERENTIAL EQUATIONS

Example

1. Form the differential equation of the family of circles having their centres at the origin.

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2. Form the differential equation of all non-horizontal lines in a plane.

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

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4. Form the differential equations not containing the arbitrary constants and satisfied by the equations:

$ay^2 = (x - c)^3$, c being an arbitrary constant.

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5. Form the differential equations not containing the arbitrary constants and satisfied by the equations:

$y = ae^{bx}$, a and b arbitrary constants.

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6. Find the differential equation of the family of curves $(x-a)^2 + (y-b)^2 = r^2$, where a and b are arbitrary constants.

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7. Form the differential equation of the family of circles touching the X-axis at origin.

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8. $ae^{3x} + be^{7x} + ce^{2x}$, a,b,c are arbitrary constants.

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9. Find the differential equation of

all circles in a plane is order 3.

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10. Find the differential equation of

all parabolas having their vertices at the origin and foci on x-axis.

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11. Find the differential equation of

all ellipse whose centres are at the origin and principal axes along coordinate axes.

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12. The differential equation of all straight lines which are at a constant distance p from the origin, is

(a) $(y + xy_1)^2 = p^2(1 + y_1^2)$

(b) $(y - xy_1^2) = p^2(1 + y_1)^2$

(c) $(y - xy_1)^2 = p^2(1 + y_1^2)$

(d) None of these

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13. Obtian the differential equation of the family of circles passing through the fixed points (a,0) and (-a,0), $a \neq 0$

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14. Form the differential equation satisfied by $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$, a is an arbitrary constant.

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15. The differential equation satisfying the curve $\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1$ when λ begin arbitary uknowm, is

(a) $(x+yy_1)(xy_1-y)=\left(a^2-b^2\right)y_1$

(b) $(x+yy_1)(xy_1-y)=y_1$

(c) $(x - yy_1)(xy_1 + y)\left(a^2 - b^2\right)y_1$

(d) None of these

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16. Solve for differential equation.

$$\left(x^3 - x\right)\frac{dy}{dx} - \left(3x^2 - 1\right)y = x^5 - 2x^3 + x.$$

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17. Show that the function $y = Ax + \frac{B}{x}, x \neq 0$, is a solution of the differntial equation.

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

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18. Show that $y = (a + bx)e^{2x}$ is a solution of the differntial equation $y_2 - 4y_1 + 4y = 0$.

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

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20. Solve the following differntial equations:

$(x + 2)dy = \left(x^2 + 4x - 9\right)dx$

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21. Solve the following differntial equations:

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

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22. Solve the following differential equations

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

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23. Solve the following differential equations

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

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24. Solve the following differential equations

$3e^x \tan y dx + (1 - e^x)\sec^2 y dy = 0$

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25. Solve the differential equation

$(y^3 + 1)(e^x + xe^x)dx - xe^x y^2 dy = 0.$

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26. Solve $\frac{dy}{dx} = \sin^3 x + e^x.$

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27. If $y\sqrt{1-x^2}+x\sqrt{1-y^2}=1$, then prove that $\frac{dy}{dx}=-\sqrt{\frac{1-y^2}{1-x^2}}$

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28. The solution of the differential equation $\frac{dy}{dx}=e^{x-y}+x^2e^{-y}$ is

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29. Solve the differntial equations:

$\frac{dy}{dx}=\log(x+1)$

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30. Solve the differntial equations:

$$\frac{dy}{dx} = x \log x$$

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31. Solve the differntial equations:

$$\frac{dy}{dx} = \frac{x(2\log x + 1)}{(\sin y + y\cos y)}$$

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32. Solve the differntial equations:

$$\cos ecx \log y dy + x^2 y^2 dx = 0$$

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33. Solve the following differential equations

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

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34. Solve the following differential equation

$x\cos ydy=(xe^x\log x+e^x)dx$

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35. Solve the following differntial equations:

$\sqrt{a+x}\frac{dy}{dx}=-x.$

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36. If $\frac{dy}{dx} + \frac{1+y^2}{1+x^2} = 0$, show that $x + y = A(1 - xy)$.

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37. Find the particular solution of $y(1-x^2)\frac{dy}{dx} + x(1-y^2) = 0$, given that y=0 when x=0

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38. Solve the initial value problem $\frac{dy}{dx} = -4xy^2, y(0) = 1$

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39. Solve the differential equation $\frac{dy}{dx} = \cos^3 x \sin^4 x + x\sqrt{2x-1}$.

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40. Find the solution of the differential equation

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

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41. Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x + y + xy$ given that y=0 when x=1.

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42. Solve the equation $2(y+3) - xy\frac{dy}{dx} = 0$, given that y(1)=-2.

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43. A point moves in a straight line and after t seconds, its accelearation is $(2t+1)\frac{cm}{\sec^2}$. If its velocity is 4cm/sec when t=0, find its velocity after 2 seconds and the distance moved it by in 3 seconds.

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44. The velocity v of a parachute falling vertically satisfies the equation $v\frac{dv}{dx} = g\left(1 - \frac{v^2}{k^2}\right)$, where g and k are positive constants, if both v and x are zero initially, find v in terms of x.

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45. The slope of the tangent at a point P(x,y) on a curve is $-\frac{y+3}{x+2}$. If the curve passes through the origin, find its equation.

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46. The line normal to a given curve at each point (x,y) on the curve passes through the point (2,0). If the curve contains the point (2,3), find its equation.

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47. Find the equation of a curve, the slope of tangent to which at any point (x,y) other than origin is $y + \frac{y}{x}$.

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48. Find the equation of a curve passing through the point (–2, 3), given that the slope of the tangent to the curve at any point (x, y) is $2\frac{x}{y^2}$

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49. A population grows at the rate of 2.5% per annum. How long does it take for the population to double?

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50. In a bank, principal increases continuously at the rate of 5% per year. In how many years Rs 1000 double itself?

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51. The temperature T of a cooling drops at a rate proportional to the difference T-S, where S is the constant temperature of surrounding medium. A thermometer reading $80^\circ F$ was taken outside. Five minutes later, the thermometer read $60^\circ F$. After another five minutes the reading was $50^\circ F$. what was the outside temperature?

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52. Radium decomposes at a rate proportional to the quantity of radium present. It is found that in 25 years, aproximately 1.1% of a certain quantity of radium has decomposed. Determine approximately how long will it take for half of the original amount to decompose?

(given $\log_e(.989) = -0.01106$ and $\log_e 2 = 0.6931$)

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53. Solve the following differential equations:

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

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54. Solve the following differential equations:

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

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55. Solve the following differential equations:

$$x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$$

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56. Solve the following differential equations:

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

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57. Solve the following differential equations

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

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58. Solve the following differential equations:

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

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59. Solve: $\left(x^2-y^2\right)dx-xydy=0$

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60. Find the particular solution of the differential equation $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$ given that y=1, when x=0.

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61. A curve passing through the point (1,1) has the porperty that the perpendicular distance of the normal at any point P on the curve from the origin is equal to the distance of P from x-axis Determine the equation of the curve.

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62. Solve the following differential equations:

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

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63. Solve the following differential equations:

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

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64. Solve the following differential equations:

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

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65. Solve the following differential equations:

$2ye^{\frac{x}{y}}dx + \left(y - 2e^{\frac{x}{y}}\right)dy = 0$, when x(1)=0

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66. The solution of $\frac{xdy}{x^2+y^2} = \left(\frac{y}{x^2+y^2} - 1\right)dx,$ is given by

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67. Solve the differential equation $x^2\frac{dy}{dx} - xy = 1 + \cos\left(\frac{y}{x}\right),$ $x \neq 0$ and $y = \frac{\pi}{2}$ when x=1

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68. Find the equation of a curve passing through the point $\left(1, \frac{\pi}{4}\right)$ if the slope of the tangent to the curve at any point P(x,y) is $\frac{y}{x} - \cos^2\left(\frac{y}{x}\right)$

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69. Solve $\frac{dy}{dx} = \frac{x+y+1}{2x+2y+3}$

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70. Solve the equation $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$

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71. Solve the differential equation

$$\left(x^2+4y^2-5\right)xdx+\left(4x^2-3y^2-1\right)ydy=0$$

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72. Solve the following differential equations:

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

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73. Solve the following differential equations:

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

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74. Solve the following differential equations:

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

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75. Solve the following differential equations:

$\frac{dy}{dx} - (\tan x)y = \sin x e^{\sin x}, 0$

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76. Solve the following differential equations:

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

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77. Solve the following differential equations:

$$\left(x^2 - 1\right)\frac{dy}{dx} + 2xy = \frac{1}{x^2 - 1}, x^2 \neq 1.$$

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78. Solve $\frac{dy}{dx} - 2y\cos x = -2\sin 2x.$

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

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80. Find the particular solution of the differential equation

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

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81. Find the particular solution of the differential equation

$(1 + x^2)\frac{dy}{dx} l = e^{m\tan^{-1} x} - y$ given that y=1 when x=0

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82. If $\frac{dy}{dx} + 2xy = x$, then prove that $2y = 1 + e^{-x^2}$ given y=1 when x=0

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83. Solve the differential equation $ydx + \left(x - y^2\right)dy = 0, y > 0$

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84. Find the general solution of $(1 + \tan y)(dx - dy) + 2xdy = 0$, `-pi/4

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85. Solve the differential equation $ydx + \left(x - y^2\right)dy = 0, y > 0$

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86. The equation of electromotive force for an electric circuit contianing resistance and self inductance is $E = Ri + L\frac{di}{dt}$, where E is the electromotive force given to the circuit, R, the resistance and L, the coefficient of induction. Find the current 'i' at time t when

E= 0

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87. The equation of electromotive force for an electric circuit contianing resistance and self inductance is $E = Ri + L\frac{di}{dt}$, where E is the electromotive force given to the circuit, R, the resistance and L, the coefficient of induction. Find the current 'i' at time t when

E= 0

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88. Solve the differential equation

$(y \sin 2x)dx - \left(1 + y^2 + \cos^2 x\right)dy = 0$

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89. Solve the differential equation

$$\left(1+y^2\right)+(2xy-\cot y)\frac{dy}{dx}=0$$

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90. Solve the differential equaions

$$\frac{dy}{dx}+\frac{2}{x}y=3x^2, x>0$$

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91. Solve the equation $\frac{dy}{dx}+\frac{1}{x}y=x^2y^6, x>0$

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92. Solve the differential equation $(x-1)dy + ydx = x(x-1)y^{1/3}dx.$

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93. Solve the differential equation $\sec^2 y \frac{dy}{dx} + 2x \tan y = x^3$

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94. Solve the differential equation $\frac{d^2y}{dx^2} = \sec^2 x + xe^x$

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95. Solve the differential equation $\frac{d^2y}{dx^2} = \log x$

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96. Solve the differential equation $\frac{d^2y}{dx^2} = \frac{x-1}{(2x-x^2)^{3/2}}$

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97. Solve the differential equation $\frac{d^2y}{dx^2} = x\sin x$ given that $y = 0, \frac{dy}{dx} = -1$ when x=0.

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98. Solve the differential equation $\frac{d^2y}{dx^2} = x + \sin x$ subject to the condition that $\frac{dy}{dx} = 0$ and $y = 0$ when $x = 0$.

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Exercise

1. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$\left(xy^2 + x\right)dx + \left(y - x^2y\right)dy = 0$$

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2. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

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

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3. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$\frac{1}{x}\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right) = 3\log x$$

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4. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$\left(\frac{d^2x}{dt^2}\right)^2 + 3\left(\frac{dx}{dt}\right)^3 = 5t^2$$

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5. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

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

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6. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$t^2\left(\frac{d^2s}{dt^2}\right)-st\frac{ds}{dt}=s$$

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7. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}=5\left(\frac{d^2y}{dx^2}\right)$$

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8. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$y = px + \sqrt{a^2p^2 + b^2}$, where $p = \dfrac{dy}{dx}$.

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9. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

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

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10. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

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

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11. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

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

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12. Determine the order and the degree of each of the following equations. Also state if these are linear or non-linear.

$$\frac{d^3y}{dx^3} + y^2 + e^{(dy)/(dx)} = 0.$$

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13. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y=a\sin(x+b)$, a and b are arbitrary constants.

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14. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y=A\cos nx+B\sin nx$, A and B are arbitrary constans.

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15. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y = Ae^{-mx} + Be^{-mx}$, A and B are arbitrary constants.

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16. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y = a\sin(mx + b)$, a and b are arbitrary constants.

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17. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y = c\sin^{-1} x$, c is an arbitrary constant

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18. $c(y+c)^2 = x^3$, c is an arbitrary constant.

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19. $y^2 - 2ay + x^2 = a^2$, a is an arbitrary constant.

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20. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation: $y = a\cos(mx + b)$, a, b are arbitrary constants.

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21. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

y=Acosnx+B sinnx, A and B are arbitrary constans.

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22. $y = Ae^{2x} + Be^{-2x}$, where A and B are arbitrary constants.

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23. $y = ae^{2x} + be^{-3x}$, a and b being arbitrary constants.

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24. In each of the following cases, from the differential equation by eliminating the arbitrary constants from the given equation:

$y = a\sin(mx + b)$, a and b are arbitrary constants.

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25. Find the differential equation from $y = e^x(A\cos x + B\sin x)$, where A and B are arbitrary constants.

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26. $y^2 = m(n^2 - x^2)$,m,n are arbitray constants.

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27. $y = ae^x + be^{2x} + ce^{3x}$, a,b,c are arbitrary constants.

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28. $ae^{3x} + be^{7x} + ce^{2x}$, a,b,c are arbitrary constants.

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29. $x^2 + y^2 + 2ax + 2by + c = 0$, a,b,c are arbitrary constants.

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30. $Ax^2 + By^2 = 1$, A and B are arbitrary constants.

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31. Obtain the differential equation of each of the following families of plane curves:

circles with centre on y-axis.

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32. Obtain the differential equation of each of the following families of plane curves:

straight lines which pass through the origin.

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33. Obtain the differential equation of each of the following families of plane curves:

circles having their centres on x-axis.

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34. Obtain the differential equation of each of the following families of plane curves:

all circles which pass through the origin and whose centres lie on y-axis.

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35. Form the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

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36. Obtain the differential equation of each of the following families of plane curves:

all circles having centre at (1,2)

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37. Obtain the differential equation of each of the following families of plane curves:

all circles touching y-axis at origin.

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

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39. A spherical rain drop evaporates at a rate proportioanl to its surface area. Form a differntial equation involving the rate of change of the radius of the rain drop.

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40. The differential equation of all parabolas having their axes of symmetry coincident with the axes of x, is

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41. Show that the differntial equation that represents all parabolas each of which has a latus rectum 4a and whose axes are parallel to x axis is $2ay_2 + y_1^3 = 0$.

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42. Find the differntial equation of all circles which pass through the origin and whose centres lie on x-axis.

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43. The differential equation of all conics whose axes coincide with the coordinate axes, is

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44. Form the differntial equation which is satisfied by $\sqrt{1-x^4}+\sqrt{1-y^4}=a\left(x^2-y^2\right)$, 'a' being an arbitrary constant.

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45. Form the differntial equation which is satisfied by $x^p \hat{} y^q=\lambda(x+y)^{p+q}$, where λ is arbitrary constant.

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46. The differential equation having $y=\left(\sin^{-1}x\right)^2+A\left(\cos^{-1}x\right)+B$, where A and B are abitary

constant , is

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47. Verify that the given function is a solution of the differential equation:

$(y-x)dy-\left(y^2-x^2\right)dx=0, y=-x-1.$

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48. Verify that the given function is a solution of the differential equation:

$y=x\frac{dy}{dx}+a\frac{dx}{dy}, y=cx+\frac{a}{c}$

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49. Verify that the given function is a solution of the differential equation:

$$y = x\frac{dy}{dx} + a\frac{dx}{dy}, y^2 = 4ax.$$

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50. Verify that the given function is a solution of the differential equation:

$$y_1 + y = 0, y = ce^{-x}$$

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51. Verify that the given function is a solution of the differential equation:

$$y_3 - 6 = 0, y = x^3 + ax^2 + bx + c.$$

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52. Verify that the given function is a solution of the differential equation:

$y_2 + 4y = 0, y = A\cos 2x + B\sin 2x$

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53. Verify that the given function is a solution of the differential equation:

$y_2 + y = 0, y = a\cos x + b\sin x.$

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54. 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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55. Prove that $x^2 - y^2 = c\left(x^2 + y^2\right)^2$ is the general solution of differential equation $\left(x^3 - 3xy^2\right)dx = \left(y^3 - 3x^2y\right)dy$, where c is a parameter.

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56. Show that function $y = be^x + ce^{2x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$.

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57. Show that the diffential equation of which $y = 2\left(x^2 - 1\right) + Ce^{-x^2}$ is a solution is $\frac{dy}{dx} + 2xy = 4x^3$.

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58. Solve the following differential equations

$$\frac{dy}{dx} = x^5 + x^2 - \frac{2}{x}$$

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59. Solve the following differential equations

$$\frac{dy}{dx} = x^2 + \sin 3x$$

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60. Solve the following differential equations: $\frac{dy}{dx} + y = 1$

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61. Solve the following differential equations

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

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62. Solve the following differential equations:

$$dx = \left(x^2 + 2x + 2\right)dy$$

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63. Solve the following differential equations:

$$\left(x^2 + 1\right)\frac{dy}{dx} = 1$$

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64. Solve the following differential equations:

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

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65. Solve the following differential equations:

$$(x+2)\frac{dy}{dx} = 4x^2y$$

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66. Solve the following differential equations:

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

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67. Solve the following differential equations:

$$\left(e^{x}+e^{-x}\right)\frac{dy}{dx}=e^{x}-e^{-x}$$

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68. Solve the following differential equations:

$$\sec^{2}x\tan ydx+\sec^{2}y\tan xdy=0$$

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69. Solve the following differential equations:

$$\left(\tan^{2}x+2\tan x+5\right)\frac{dy}{dx}=2(1+\tan x)\sec^{2}x$$

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70. Solve the following differential equations:

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

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71. Solve the following differential equations:

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

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72. Solve the following differential equations:

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

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73. Solve the following differential equations:

$\cos y dy + \cos x \sin y dx = 0$

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74. Solve the following differential equations:

$\frac{dy}{dx} + \frac{\cos x \sin y}{\cos y} = 0$

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75. Solve the following differential equations:

$(1 + \cos 2x)dy = (1 - \cos 2x)dx$

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76. Solve the following differential equations:

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

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77. Solve the following differential equations:

$ydx-xdy=-\left(1-x^2\right)dx$

Watch Video Solution

78. Solve the following differential equations:

$\frac{dy}{dx}=\log x$

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79. Solve the following differential equations:

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

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80. Solve the following differential equations:

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

Watch Video Solution

81. Solve the following differential equations:

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

Watch Video Solution

82. Solve the following differential equations:

$(e^x + 1)ydy = (y + 1)e^x dx$

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83. Solve the following differential equations:

$\left(1 - x^2\right)dy + xydx = xy^2 dx.$

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84. Solve the following differential equations:

$(x - 1)dy = 2x^3 ydx$

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85. Solve the following differential equations:

$x \log x dy - y dx = 0$

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86. Solve the following differential equations:

$\sin^3 x \frac{dx}{dy} = \sin y$

Watch Video Solution

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

Watch Video Solution

88. Solve the following differential equations:

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

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89. Solve the following differential equations:

$$ydx + \left(1 + x^2\right)\tan^{-1} x dy = 0$$

Watch Video Solution

90. Solve the following differential equations:

$$x^{-1}\cos^2 ydy + y^{-1}\cos^2 xdx = 0$$

Watch Video Solution

91. Solve the following differential equations

$4e^x \tan y dx + 3(1 + e^x)\sec^2 y dy = 0$

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92. Solve the following differential equations:

$(1 + y^2)xdx + 2y(1 + x^2)dy = 0.$

Watch Video Solution

93. Solve the following differential equations:

$\frac{dy}{dx} - x^3 = \frac{1}{x \log x}.$

Watch Video Solution

94. Solve the following differential equations

$\log \frac{dy}{dx} = ax + by$

Watch Video Solution

95. Solve the following differential equations:

$\log ydy + x^2 ydx = 0.$

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96. Solve the equation $\sqrt{1-x^2}dy + \sqrt{1-y^2}dx = 0$, given that when x=1, $y = \frac{\sqrt{3}}{2}$.

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

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

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99. Given that $\frac{dy}{dx}=ye^x$ and y=e when x=0. find y when x=1

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100. If y(x) is a solution of the differential equation $\left(\frac{2+\sin x}{1+y}\right)\frac{dy}{dx} = -\cos x$ and y(0)=1 then find the value of $y\left(\frac{\pi}{2}\right)$

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101. Solve the following initial value problems:

y'=secy, y(0)=0

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102. Solve the following initial value problems:

$2xy' = 3y, y(1) = 4$

Watch Video Solution

103. Solve the following initial value problems:

$y' = y \cot 2x, y\left(\frac{\pi}{4}\right) = 2$

Watch Video Solution

104. Solve the following initial value problems:

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

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105. Solve the following initial value problems:

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

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106. Find the particular solution of $\sin\left(\frac{dy}{dx}\right) = a$, given that y=1 when x=0.

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107. Find the equation of the curve through the point (1,0) if the slope of the tangent to the curve at any point (x,y) is $\frac{y-1}{x^2+x}$.

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108. Find the particular solution of the differential equation $e^{\frac{dy}{dx}} = a$, given that y=1 when x=0.

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109. A population grows at the rate of 2.5% per annum. How long does it take for the population to double?

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110. 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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111. The temperature T of a cooling object drops at a rate proportional to the difference T-S, where S is the constant temperature of the surrounding medium. Thus,

$\frac{dT}{dt} = -k(T-S)$, where k(>0) is constant and t is the time. Solve the differntial equation if it is given that T(0)=150.

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112. The equation of curve for which the normal at every point passes through a fixed point is

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113. Experiments show that radium decomposes at a rate proportioanl to the amount of radium present at the moment. If its half life is 1570 years, what percentage will disappear in one years?

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114. The rate of increase of bacterial in a certain culture is proportional to the number of bacterial present. If it is found that the number doubled in 5 hours, prove that the bacterial becomes eight times at the end of 15 hours.

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115. In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present?

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116. Find the equation of a curve passing through the point (1,1), if the tangent drawn at any point P(x,y) on the curve meets the coordinate axes at A and B such that P is the mid point of AB.

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117. Solve the differential equations:

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

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118. Solve the differential equations:

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

Watch Video Solution

119. Solve the differential equations:

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

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120. Solve the differential equations:

$$\frac{dy}{dx} = \sin(x = y).$$

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121. Solve the differential equations:

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

Watch Video Solution

122. Solve the differential equations:

$$\frac{dy}{dx} = (2x + 3y - 4)^2$$

Watch Video Solution

123. Solve the differential equations:

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

Watch Video Solution

124. Solve the differential equations:

$$\cos(x + y)dy = dx$$

Watch Video Solution

125. Solve the differential equations:

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

Watch Video Solution

126. Solve the differential equations:

$$(x+y)(dx-dy) = dx+dy$$

Watch Video Solution

127. Solve the differential equations:

$$(x-y)\left(\frac{dy}{dx}\right) = x+3y$$

Watch Video Solution

128. Solve the differential equations:

$x^2y' = x^2 + xy + y^2$

Watch Video Solution

129. Solve the differential equations:

$2xyy' = x^2 + y^2$

Watch Video Solution

130. Solve the differential equations:

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

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131. Solve : $\left(3xy + y^2\right)dx + \left(x^2 + xy\right)dy = 0.$

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132. Solve the differential equations:

$y^2dx + \left(x^2 - xy + y^2\right)dy = 0$

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133. Solve the differential equation :

$\left(x^2 - y^2\right)dx + 2xydy = 0.$

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134. Solve the differential equations:

$$x^2 y dx - \left(x^3 + y^3\right) dy = 0$$

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135. Solve the differential equations:

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

Watch Video Solution

136. Solve the differential equation:

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

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137. Solve the differential equations:

$x^2dy + \left(xy + y^2\right)dx = 0, y(1) = 1$

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138. Solve the differential equations:

$\left(x^2 - y^2\right)dx + 2xydy = 0, y(1) = 1$

Watch Video Solution

139. Solve the differential equations:

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

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140. Solve the differential equations:

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

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141. Solve the differential equations:

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

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142. Solve the differential equations:

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

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143. Solve the differential equations:

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

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144. Solve the differential equations:

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

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145. Solve the differential equations:

$$x\frac{dy}{dx} = y\frac{\tan y}{x}, \text{x>0}$$

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146. Solve the differential equation $xdy - ydx = \sqrt{x^2 + y^2}dx$

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147. Solve the differential equation $xdy - ydx = \sqrt{x^2 + y^2}dx$

Watch Video Solution

148. Solve the differential equation:

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

Watch Video Solution

149. Solve the differential equations:

$$x\cos x\left(\frac{dy}{dx}\right) + y(x\sin x + \cos x) = 1$$

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

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151. Solve the differential equations:

$$x^3\frac{dy}{dx} = y^3 + y^2\sqrt{y^2 - x^2}, x > 0$$

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152. Solve the following differential equations:

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

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153. Solve the differential equations:

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

Watch Video Solution

154. Solve the differential equations:

$$\left(x\frac{dy}{dx} - y\right)e^{y/x} = x^2\cos x$$

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155. Solve the differential equations:

$$\frac{dy}{dx} = \frac{-6x + 2y - 4}{-3x + y + 3}$$

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156. Solve the differential equations:

$$\frac{dy}{dx} = \frac{x + 2y - 1}{2x + 4y + 2}$$

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157. Solve the differential equations:

$$(3x + 2y + 1)dx + (6x + 4y + 5)dy = 0$$

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158. Solve the differential equations:

$$(2x + 3y - 5)dy + (3x + 2y - 5)dx = 0.$$

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159. Solve the differential equations:

$$(3x - 7y - 3)dy - (3y - 7x + 7)dx = 0$$

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160. Solve the differential equations:

$$\frac{dy}{dx} = \frac{y - x + 1}{y + x + 5}$$

Watch Video Solution

161. Solve the differential equations:

$$(x - y - 1)dy - (x - y - 3)dx = 0$$

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162. The solution of $(2x^2 + 3y^2 - 7)xdx - (3x^2 + 2y^2 - 8)ydy = 0$ is given by

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

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164. Solve the differential equations:

$(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy = 0$

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

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166. Find the equation of a curve passing through (2,1) if the slope of the tangent to the curve at any point (x,y) is $\frac{x^2+y^2}{2xy}$

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167. Find the equation of a curve passing through the origin if the slope of the tangent to the curve at any point (x,y) is equal to the square of the difference of the abscissa and the ordinate of the point.

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168. Solve the differential equation:

$$\frac{dy}{dx} + y = 0$$

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169. Solve the differential equation:

$$\frac{dy}{dx} + 2y = 6e^{x}$$

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170. Solve the differential equation:

$$\frac{dy}{dx} + \frac{y}{x} = e^{-x}$$

Watch Video Solution

171. Solve the differential equation:

$$4\frac{dy}{dx} + 8y = 5e^{-3x}$$

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172. Solve the differential equation:

$$\frac{dy}{dx} + ay = e^{mx}$$

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173. Solve the differential equation:

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

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174. Solve the differential equation:

$$\frac{dy}{dx} - y = xe^x$$

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175. Solve the differential equation:

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

Watch Video Solution

176. Solve the differential equation:

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

Watch Video Solution

177. Solve the differential equation:

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

Watch Video Solution

178. Solve the differential equation:

$$\frac{dy}{dx} - 2y = \cos 3x$$

Watch Video Solution

179. Solve the differential equation:

$$\frac{dy}{dx} - 2y = \cos 3x$$

Watch Video Solution

180. Solve the differential equation:

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

Watch Video Solution

181. Solve the differential equation:

$$\frac{dy}{dx} + 2y = xe^{4x}\Big)$$

Watch Video Solution

182. Solve the differential equation:

$$\frac{dy}{dx} - 3y = \sin 2x$$

Watch Video Solution

183. Solve the differential equation:

$$x\frac{dy}{dx} + y = 3x\cos 2x,\ x > 0$$

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184. Solve the differential equation:

$$x\frac{dy}{dx} - 3y = -2kx,\ x > 0$$

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

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186. Solve the differential equation:

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

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187. Solve the differential equation:

$$\frac{dy}{dx} + y\tan x = 2x + x^2 \tan x, 0 < x < \frac{\pi}{2}$$

Watch Video Solution

188. Solve the differential equation:

$$\frac{dy}{dx} + \frac{y}{x} = \cos x + \frac{\sin x}{x}\Big), x > 0$$

Watch Video Solution

189. Solve the differential equation:

$$x\frac{dy}{dx} + y = x\log x, x > 0$$

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190. Solve the differential equation :

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

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191. Solve the differential equation:

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

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192. Solve the differential equation:

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

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193. The solution of $\left(1+x^2\right)\frac{dy}{dx}+y=e^{\tan^{-1}x}$, is given by

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194. 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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195. Solve the differential equation:

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

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196. Solve the differential equation:

`(dy)/(dx)=ytanx-2sinx,0

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197. Solve the differential equation:

$$x\cos x\frac{dy}{dx} + y(x\sin x + \cos x) = 1, `0$$

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198. Solve the differential equation:

$$\cos^3 x \frac{dy}{dx} + y \cos x = \sin x$$

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199. Solve the differential equation:

$$dy = x\left(x^2 - 2y\right)dx$$

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200. Solve the differential equation:

$$ydx - xdy + (\log x)dx = 0$$

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201. Solve the differential equation:

$$y + d\frac{xy}{dx} = x(\sin x + \log x)$$

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202. Solve the differential equation:

$$\frac{dy}{dx} + \frac{4x}{x^2+1}y = \frac{1}{(x^2+1)^3}$$

Watch Video Solution

203. Solve the differential equation:

$$dx + xdy = e^{-y}\log ydy,\ y > 0.$$

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204. Solve the differential equation:

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

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205. Solve the differential equation:

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

Watch Video Solution

206. Solve the differential equation:

$$ydx + \left(x - y^3\right)dy = 0, y > 0$$

Watch Video Solution

207. Solve the differential equation:

$$\frac{dy}{dx} + xy = x^3y^3$$

Watch Video Solution

208. Solve the differential equation:

$$\frac{dy}{dx} - 2y\tan x = y^2\tan^2 x, 0$$

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209. Solve the differential equation:

$\left(x^2 + y^2\right)dx + 2xydy = 0$, given when x =1 y=0

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210. Solve the differential equation:

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

Watch Video Solution

211. Solve the differential equation:

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

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212. Find the solution of $\frac{dy}{dx} + \frac{2}{x} y = \frac{1}{x^2}, x \neq 0$ which satisfies y(2)=2y(1)

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213. Solve the differential equation $dy = \cos x(2 - y\cos ecx)dx$ given that y=2 and $x = \frac{\pi}{2}$

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214. Find the particular solution of the differential equation $\frac{dy}{dx} = -\frac{x + y\cos x}{1 + \sin x}$ given that y=1, when x=0

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215. Find the equation of a curve passing through the origin and satisfying the differential equation $(1 + x^2)\frac{dy}{dx} + 2xy = 4x^2$

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216. If y(t) is a solution of $(1+t)\frac{dy}{dt} - ty = 1$ and y(0)=-1, then show that $y(1) = -\frac{1}{2}$

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217. Find the equation of a curve passing through the point (0, 1). If the slope of the tangent to the curve at any point (x, y) is equal to the sum of the x coordinate (abscissa) and the product of the x coordinate and y coordinate (ordinate) of that point.

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218. Solve the differential equations:

$\frac{d^2y}{dx^2} = 0.$

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219. Solve the differential equations:

$$\frac{d^2y}{dx^2} = \cos x - \sin x$$

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220. Solve the differential equations:

$$\frac{d^2y}{dx^2} = x.$$

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221. Solve the differential equations:

$$\frac{d^2y}{dx^2} = x^2 + e^{2x}$$

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222. Solve the differential equations:

$$\frac{d^2y}{dx^2} = x \sin x$$

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223. Solve the differential equations:

$$\frac{d^2y}{dx^2} + \cos 2x = (x+1)e^x.$$

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224. Solve the differential equations:

$$\frac{d^2y}{dx^2} = \sin^{-1} x.$$

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225. Solve the differential equations:

$$x^2 \frac{d^2y}{dx^2} = \log x$$

Watch Video Solution

226. Solve the differential equations:

$$\frac{d^2y}{dx^2} = xe^x$$

Watch Video Solution

227. Solve the differential equations:

$$\frac{d^2y}{dx^2} = \sin^2 x$$

Watch Video Solution

228. Solve the differential equation $x\frac{d^2y}{dx^2} = 1$ given that y= 1, $\frac{dy}{dx} = 0$ when x=1.

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229. Solve the differential equation $\frac{d^2y}{dx^2} = \frac{1}{x} + 6$ given that $\frac{dy}{dx} = 0$ and y=0 when x=1.

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230. Form the differential equation of the system of parallel lines given by y=c, c being an arbitrary constant.

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231. Form the differential equation of the system of parallel lines given by $x + y = c$, c being an arbitrary constant.

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232. Form the differential equation of the system of concentric circles given by $x^2 + y^2 = r^2$ where r(>0) is an arbitrary constant.

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233. Form the differential equation satisfied by the relation y=mx+c where both m and c are arbitrary constants.

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234. Find the differential equation satisfied by the family of parabolas $y^2 = 4ax$, where $a \neq 0$ is an arbitrary constant.

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235. Find the differential eqution of the family of curves $y = Ae^{2x} + Be^{-2x}$

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236. Find the differential equation of all non-vertical lines in a plane.

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237. Find the general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$

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238. Find the solution of $\frac{dy}{dx} = 2^{y-x}$

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

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240. Solve the differential equation xdy+ydx=0.

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241. Solve the differential equation xdx+ydy=0,

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242. Find the differential equation of the family of lines through the origin.

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243. Given that $\frac{dy}{dx} = ye^x$ and y=e when x=0. find y when x=1

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244. Form the differential equation of all non-horizontal lines in a plane.

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245. Given that $\frac{dy}{dx} = e^{-2y}$ and y=0 when x=5. Find the value of x when y=3.

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246. Solve the differential equation $e^{3x}\frac{dy}{dx} = 1.$

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247. Solve the differential equation $\frac{dy}{dx} = 0.$

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

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249. What is the degree of the differential equation $\left(\frac{dy}{dx}\right)^2 - x\frac{d^2y}{dx^2} = \log_e x$?

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250. Write the order of the differential equation $\left(\frac{dy}{dx}\right)^3 + \left(\frac{D^2y}{dx^2}\right) = \frac{d^3y}{dx^3}$

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251. Solve the differential eqution $\frac{dy}{dx} = \log x$

Watch Video Solution

252. Find the particular solution of the differential equation $\frac{dy}{dx} = e^x$ when it is given that y=1 for x=0.

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253. Solve the differential equation $\log_e\left(\frac{dy}{dx}\right) = x.$

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254. Write down the integrating factro for the differential equation $\frac{dy}{dx} + \left(\frac{1}{x^2}\right)y = \frac{1}{x}$

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255. Find an integrating factor for the differential equation $\frac{dy}{dx} + \frac{1}{x \log x}y = \frac{x^2}{\log x}$, where x>1.

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256. Find the differential equation which is satisfied by y=Asinx+Bcosx, A and B being arbitrary constants.

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257. State whether the differential equation $x\sqrt{x}\frac{d^4y}{dx^4}+2\left(\frac{dy}{dx}\right)^3=3y^3-x^2$ is linear or non linear.

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258. Fill ups

Degree of a linear differential equation is always.....

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259. Write down the order of the differential equation which is satisfied by all functions of the type $x^py^q=\lambda(x+y)^{p+q}$, where λ is an arbitrary constant.

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260. Write down the order of the differential equation of the family of all circles in a plane which have a fixed raduis r.

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261. The integrating factor of the differential equation $(1+y^2)+(2xy-\cot y)\frac{dy}{dx}=0$ is.....

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262. Solve the differential equations:

$$\frac{d^2y}{dx^2}=0.$$

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263. What is the order of the differential equation of all circles in a plane?

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264. Find the integrating factor the differential equation $x \log x \frac{dy}{dx} + y = 2 \log x$

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

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266. The degree of differential equation:

$$\frac{d^4y}{dx^4} + \sin(y''') = 0$$

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267. Determine order and degree of differential equations:

$$y' + 5y = 0$$

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

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269. The degree of differential equation:

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

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270. Determine order and degree (if defined) of differential equation: $\left(\frac{d^2y}{dx^2}\right) = \cos 3x + \sin 3x$

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271. Determine order and degree of differential equations:

$(y'')^2 + (y'')^3 + (y')^4 + y^5 = 0.$

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272. Determine order and degree (if defined) of differential equation: $(y'')+(2y'')+(y')=0$

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273. Determine order and degree of differential equations:

$y'+y=e^x$

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274. Determine order and degree of differential equations:

$y''+(y')^2+2y=0$

Watch Video Solution

275. Determine order and degree of differential equations:

$y'' + 2y' + \sin y = 0$

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276. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$ is :

A. 3

B. 2

C. 1

D. not defined

Answer:

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277. The order of the differential equation $2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is 2.

A. 2

B. 1

C. 0

D. not defined

Answer:

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

$y = e^x + 1 : y'' - y' = 0$

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

$y = x^2 + 2x + C : y' - 2x - 2 = 0$

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

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

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281. Verifty that the given function (explicit or implict) is a solution of the corresponding differential equation:

$$y = \sqrt{1 + x^2} : y' = \frac{xy}{1 + x^2}$$

Watch Video Solution

282. Verify that the given function (explicit or implicit) is a solution of the corresponding differential equation: $y = Ax$:

$$xy' = y(x \neq 0)$$

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

$$y = x \sin x : xy' = y + x\sqrt{x^2 - y^2}$$

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284. Verifty that the given function (explicit or implict) is a solution of the corresponding differential equation:

xy=logy+C : $y' = \frac{y^2}{1 - xy}(xy \neq 1)$

Watch Video Solution

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

$y - \cos y = x : (y \sin y + \cos y + x)y' = y$

Watch Video Solution

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

$x + y = \tan^{-1} y : y^2 y' + y^2 + 1 = 0$

Watch Video Solution

287. Verifty that the given function (explicit or implict) is a solution of the corresponding differential equation:

$y = \sqrt{a^2 - x^2} : x + y\frac{dy}{dx} = 0 (y \neq 0, x \in (-a, a))$

Watch Video Solution

288. The number of arbitrary constants in the general solution of a differential equation of fourth order are:

A. 0

B. 2

C. 3

D. 4

Answer:

Watch Video Solution

289. The number of arbitrary constants in the particular solution of a differential equation of 'third order are-:

A. 3

B. 2

C. 1

D. 0

Answer:

Watch Video Solution

290. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: $\frac{x}{a}+\frac{y}{b}=1$

Watch Video Solution

291. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: $y^2=a\left(b^2-x^2\right)$

Watch Video Solution

292. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: `y = a

e^(3x) + b e^-2x

Watch Video Solution

293. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: $y = e^{2x}(a + bx)$

Watch Video Solution

294. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: $y = e^{x}(a\cos x + b\sin x)$

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295. Form the differential equation of the family of ellipses having foci on y-axis and centre at origin.

Watch Video Solution

296. Form the differential equation of the family of parabolas having vertex at origin and axis along positive y-axis.

Watch Video Solution

297. Form the differential equation of the family of ellipses having foci on y-axis and centre at origin.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

300. Which of the following differential equations has $y = c_1 e^x + c_2 e^{-x}$ as the general solution ?

A. $\frac{d^2y}{dx^2} + y = 0$

B. $\frac{d^2y}{dx^2} - y = 0$

C. $\frac{d^2y}{dx^2} + 1 = 0$

D. $\frac{d^2y}{dx^2} - 1 = 0$

Answer:

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301. Which of the following differential equations has $y = x$ as one of its particular solutions ?

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

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

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

D. $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + xy = 0.$

Answer:

Watch Video Solution

302. For the differential equation, find the general solution:

$$\frac{dy}{dx} = \frac{1 - \cos x}{1 + \cos x}$$

Watch Video Solution

303. For the differential equation, find the general solution:

`(dy)/dx = sqrt(4-y^2) (-2

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304. For the differential equation, find the general solution:

$$\frac{dy}{dx} + y = 1 (y \neq 1)$$

Watch Video Solution

305. For the differential equation, find the general solution:

$\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$

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306. For the differential equation, find the general solution:

$\left(e^x + e^{-x}\right) dy - \left(e^x - e^{-x}\right) dx = 0$

Watch Video Solution

307. For the differential equation, find the general solution:

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

Watch Video Solution

308. For the differential equation, find the general solution:

$y \log y dx - x dy = 0$

Watch Video Solution

309. For the differential equation, find the general solution:

$x^5 \frac{dy}{dx} = -y^5$

Watch Video Solution

310. For the differential equation, find the general solution:

$\frac{dy}{dx} = \sin^{-1} x$

Watch Video Solution

311. For the differential equation, find the general solution:

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

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312. For the differential equation, find a particular solution satisfying the given condition:

$\left(x^3 + x^2 + x + 1\right)\frac{dy}{dx} = 2x^2 + x, y = 1$ when $x = 0$

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313. For the differential equation, find a particular solution satisfying the given condition: $x\left(x^2 - 1\right)\frac{dy}{dx} = 1, y = 0$ when $x = 2$

Watch Video Solution

314. Find a particular solution satisfying the given condition:

$\cos\left(\frac{dy}{dx}\right) = a(a \in R), y = 2 when x = 0.$

Watch Video Solution

315. Find a particular solution satisfying the given condition:

$\frac{dy}{dx} = y \sin x, y = 1 when x = 0.$

Watch Video Solution

316. Find the equation of a curve passing through the points (0,0) and whose differential equation is $y' = e^x \sin x$.

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317. For the differential equation $xy\frac{dy}{dx} = (x+2)(y+2)$, find the solution curve passing through the point (1, –1).

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318. Find the equation of a curve passing through the point (0, –2) given that at any point (x, y) on the curve, the product of the slope of its tangent and y coordinate of the point is equal to the x coordinate of the point.

Watch Video Solution

319. At any point (x, y) of a curve, the slope of the tangent is twice the slope of the line segment joining the point of

contact to the point (– 4, –3). Find the equation of the curve given that it passes through (–2, 1).

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320. 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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321. In a bank, principal increases continuously at the rate of r% per year. Find the value of r if Rs 100 double itself in 10 years.

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322. In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it worth after 10 years.

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323. In a culture, the bacteria count is 1,00,000. The number is increased by 10% in 2 hours. In how many hours will the count reach 2,00,000, if the rate of growth of bacteria is proportional to the number present?

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324. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is:

A. $e^{x}+e^{-y}=C$

B. $e^{x}+e^{y}=C$

C. $e^{x}+e^{y}=C$

D. $e^{-x}+e^{-y}=C$

Answer:

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325. Show that the given differential equation is homogeneous and solve it: $\left(x^{2}+xy\right)dy=\left(x^{2}+y^{2}\right)dx$

Watch Video Solution

326. Show that the given differential equation is homogeneous and solve it:$y' = \frac{x+y}{x}$

Watch Video Solution

327. Show that the given differential equation is homogeneous and solve it: $(x-y)dy-(x+y)dx=0$

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328. Show that the given differential equation is homogeneous and solve it: $\left(x^2-y^2\right)dx+2xydy=0$

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329. Show that the given differential equations are homogeneous and solve them:

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

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330. Show that the given differntial equation is homogeneous and solve each of them.

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

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331. Show that the given differential equation is homogeneous and solve it:

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

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332. Show that the given differential equation is homogeneous and solve it: $x\left(\frac{dy}{dx}\right) - y + x\sin\left(\frac{y}{x}\right) = 0$

Watch Video Solution

333. Show that the given differential equation is homogeneous and solve it: $ydx + x\log\left(\frac{y}{x}\right)dy - 2xdy = 0$

Watch Video Solution

334. Show that the given differential equation is homogeneous and solve it: $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \left(\frac{x}{y}\right)\right)dy = 0$

Watch Video Solution

335. For the differential equation, find the particular solution satisfying the given condition:

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

Watch Video Solution

336. For the differential equation, find the particular solution satisfying the given condition:

$x^2dy+\left(xy+y^2\right)dx=0, y=1$ when $x=1$

Watch Video Solution

337. For the differential equation, find the particular solution satisfying the given condition:

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

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338. Find the particular solution satisfying the given condition:

$\frac{dy}{dx} - \frac{y}{x} + \cos ec\left(\frac{y}{x}\right) = 0, y = 0$ when $x = 1$

Watch Video Solution

339. For the differential equation, find the particular solution satisfying the given condition: $2xy + y^2 - 2x^2 \frac{dy}{dx} = 0, y = 2$ when $x = 1$

Watch Video Solution

340. A homogeneous differential equation of the form $\frac{dx}{dy} = h\left(\frac{x}{y}\right)$ can be solved by making the substitution.

A. $y = vx$

B. v=yx

C. x=vy

D. x=v

Answer:

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341. Which of the following is a homogeneous differential equation?

A. (4x+6y+5)dy-(3y+2x+4)dx=0

B. $xydx - \left(x^3 + y^3\right)dy = 0$

C. $\left(x^3 + 2y^2\right)dx + 2xydy = 0$

D. $y^2dx + \left(x^2 - xy - y^2\right)dy = 0$

Answer:

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342. For the differential equation, find the general solution:

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

Watch Video Solution

343. For the differential equation, find the general solution:

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

Watch Video Solution

344. For the differential equation, find the general solution:

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

Watch Video Solution

345. For the differential equation, find the general solution:

$$\left(\frac{dy}{dx}\right) + (\sec x)y = \tan x$$

Watch Video Solution

346. For the differential equation, find the general solution:

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

Watch Video Solution

347. For the differential equation, find the general solution:

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

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348. For the differential equation, find the general solution:

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

Watch Video Solution

349. For the differential equation, find the general solution:

$\left(1 + x^2\right)dy + 2xydx = \cot x dx (x \neq 0)$

Watch Video Solution

350. For the differential equation, find the general solution:

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

Watch Video Solution

351. For the differential equation, find the general solution:

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

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352. For the differential equation, find the general solution:

$ydx + \left(x - y^2\right)dy = 0$

Watch Video Solution

353. For the differential equation, find the general solution:

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

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354. Solve: $\frac{dy}{dx}+2y\tan x=\sin x, y=0$ when $x=\frac{\pi}{3}$

Watch Video Solution

355. For the differential equation, find a particular solution satisfying the given condition:

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

Watch Video Solution

356. For the differential equation, find a particular solution satisfying the given condition: $\frac{dy}{dx} - 3y \cot x = \sin 2x, y = 2$ when $x = \frac{\pi}{2}$

Watch Video Solution

357. Find the equation of a curve passing through the origin given that the slope of the tangent to the curve at any point (x, y) is equal to the sum of the coordinates of the point.

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358. Find the equation of a curve passing through the point (0, 2) given that the sum of the coordinates of any point on the

curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5.

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359. The integrating factor of the differential equation $x\frac{dy}{dx} - y = 2x^2$ is:

A. e^{-x}

B. e^{-Y}

C. $\frac{1}{x}$

D. x

Answer:

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360. The integrating factor of the differential equation

$(1-y^2)\frac{dx}{dy}+yx=ay, (-1<y<1)$ is:

A. $\frac{1}{y^2-1}$

B. $\frac{1}{\sqrt{y^2-1}}$

C. $\frac{1}{1-y^2}$

D. $\frac{1}{\sqrt{1-y^2}}$

Answer:

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361. For the differential equation given below, indicate its order and degree (if defined): $\left(\frac{d^2y}{dx^2}\right)+5x\left(\frac{dy}{dx}\right)^2-6y=\log x$

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362. For the differential equation given below, indicate its order and degree (if defined):

$$\left(\frac{dy}{dx}\right)^3 - 4\left(\frac{dy}{dx}\right)^2 + 7y = \sin x$$

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363. For the differential equation given below, indicate its order and degree (if defined): $\left(\frac{d^4y}{dx^4}\right) - \sin\left(\frac{d^3y}{dx^3}\right) = 0$

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

$$xy = ae^x + be^{-x} + x^2 : x\left(\frac{d^2y}{dx^2}\right) + 2\left(\frac{dy}{dx}\right) - xy + x^2 - 2 = 0$$

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365. Verify that the given function (implicit or explicit) is a solution of the corresponding differential equation: $y = e^x(a\cos x + b\sin x) : \left(\frac{d^2y}{dx^2}\right) - 2\left(\frac{dy}{dx}\right) + 2y = 0$

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366. Verify that the given function (implicit or explicit) is a solution of the corresponding differential equation: $y = x\sin 3x : \left(\frac{d^2y}{dx^2}\right) + 9y - 6\cos 3x = 0$

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367. Verify that the given function (implicit or explicit) is a solution of the corresponding differential equation: $x^2 = 2y^2(\log y) : (x^2 + y^2)\left(\frac{dy}{dx}\right) - xy = 0$

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368. 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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369. Prove that $x^2 - y^2 = c(x^2 + y^2)^2$ is the general solution of differential equation $(x^3 - 3xy^2)dx = (y^3 - 3x^2y)dy$, where c is a parameter.

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370. Form the differential equation of the family of circles in the first quadrant which touch the coordinate axes.

Watch Video Solution

371. Find the general solution of the differential equation:

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

Watch Video Solution

372. Show that the general solution of the differential equation $\left(\frac{dy}{dx}\right)+\frac{y^2+y+1}{x^2+x+1}=0$ is given by

$(x+y+1)=A)1-x-y-2xy)$, where A is parameter.

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373. Find the equation of the curve passing through the point $\left(0, \frac{\pi}{4}\right)$ whose differential equation is $\sin x \cos y dx + \cos x \sin y dy = 0$

Watch Video Solution

374. Find the particular solution of the differential equation $\left(1+e^{2x}\right)dy + \left(1+y^2\right)(e^x)dx = 0$ given that $y=1$ when $x=0$

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375. Solve the differential equation

$\left(ye^{\frac{x}{y}}\right)dx = \left(x\left(e^{\frac{x}{y}}\right) + y^2\right)dy (y \neq 0)$

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376. Find a particular solution of the differential equation $(x - y)(dx + dy) = dx - dy$ given that $y = -1$ when $x = 0$

Watch Video Solution

377. Solve the differential equation:

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

Watch Video Solution

378. Find a particular solution of the differential equation $\frac{dy}{dx} + y\cot x = 4x\,\mathrm{cosec}\,x (x \neq 0)$ given that $y = 0$ when $x = \frac{\pi}{2}$

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379. Find the particular solution of the differential equation $(x+1)\frac{dy}{dx} = 2e - y - 1$given that $y = 0$ when$x = 0$

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380. The population of a village increases continuously at the rate proportional to the number of its inhabitants present at any time. If the population of the village was 20, 000 in 1999

and 25000 in the year 2004, what will be the population of the village in 2009?

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381. The general solution of the differential equation $\frac{ydx - xdy}{y} = 0$ is:

A. xy=C

B. $x = Cy^2$

C. y=Cx

D. $y = Cx^2$

Answer:

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382. The general solution of a differential equation of the type $\frac{dx}{dy} + P_1 x = Q_1$ is:

A. $ye^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy} \right) dy + C$

B. $ye^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx} \right) dx + C$

C. $xe^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy} \right) dy + C$

D. $xe^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx} \right) dx + C$

Answer:

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383. The general solution of the differential equation $e^x dy + (ye^x + 2x)dx = 0$ is:

A. $xe^y + x^2 = C$

B. $xe^y + y^2 = C$

C. $ye^x + x^2 = C$

D. $ye^x + x^2 = C$

Answer:

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384. Fill ups

Order of the differential equation $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} = 0$is.....

Watch Video Solution

385. Fill ups

Degree of a linear differential equation is always.....

Watch Video Solution

386. Fill ups

The degree of the differential equation $\left(\frac{dy}{dx}\right)^3 + \left(\frac{d^2y}{dx^2}\right)^2 = 0$ is.....

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387. Number of arbitrary constants in the particular solution of a differential equation of order two is :

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388. $F(x, y) = \frac{\sqrt{x^2 + y^2} + y}{x}$ is a homogeneous function of degree.....

Watch Video Solution

389. Fill ups

The function $\phi(x, y) = x^2y + xy^2$ is homogenous of degree..... .

Watch Video Solution

390. Order of the differential equation representing the family of parabolas $y^2 = 4ax$ is ....

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391. The differential equation $\frac{dx}{dy} = F\left(\frac{x}{y}\right)$ can be solved by the substitution..... .

Watch Video Solution

392. The general solution of the differential equation $\frac{dy}{dx} = e^{x-y}$ is .

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393. The number of arbitrary constants in a particular solution of the differential equation $\tan x dx + \tan y dy = 0$ is .....

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394. The general solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = 1$ is.....

Watch Video Solution

395. Fill ups

The differential equation $\frac{dx}{dy} = \frac{x^2 \log(x/y) - x^2}{xy \log\left(\frac{x}{y}\right)}$ can be solved by the substitution.....

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396. Fill ups

The general solution of the equation $\frac{d^3y}{dx^3} = 0$ is.....

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397. Integrating factor of the differential equation $x\frac{dy}{dx} - y = \sin x$ is .....

Watch Video Solution

398. Fill ups

The differential equation of the family of curves $y = a\sin(bx + c)$, where a and c are arbitrary constants is..... .

Watch Video Solution

399. Fill ups

The differential equation of the family of curves y=Asinx+Bcosx is.....

Watch Video Solution

400. Solve the differential equation:

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

Watch Video Solution

401. Fill ups

The degree of the differential equation $\log\left(\frac{dy}{dx}\right) = x$ is..... .

Watch Video Solution

402. The degree of the differential equation $\sqrt{1 + \left(\frac{dy}{dx}\right)^2} = x$ is .....

Watch Video Solution

403. The degree of the differential equation $\frac{d^2y}{dx^2} + e^{\frac{dy}{dx}} = 0$ is

.....

Watch Video Solution

404. Fill ups

The degree of the differential equation $\sin\left(\frac{dy}{dx}\right) = x$ is.....

Watch Video Solution

405. Find the integrating factor the differential equation $x \log x \frac{dy}{dx} + y = 2 \log x$

Watch Video Solution

406. The general solution of a differential equation of the type $\frac{dx}{dy} + P_1 x = Q_1$ is:

Watch Video Solution

407. The integrating factor of the differential equation $\frac{dy}{dx} + y = \frac{1+y}{x}$ is

Watch Video Solution

408. Fill ups

The solution of the differential equation tanydx+xdy=0 is.....

Watch Video Solution

409. The solution of differential equation $\cot y dx = x dy$ is .....

Watch Video Solution

410. General solution of $\frac{dy}{dx} + y = \sin x$ is .....

Watch Video Solution

411. The number of arbitrary constants in the general solution of a different equation of order 4 is

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412. Fill ups

The differential equation $\frac{dy}{dx} + \frac{y}{x \log x} = \frac{1}{x}$ is a .....differential equation.

Watch Video Solution

413. $\frac{dy}{dx} + \frac{y}{x \log x} = \frac{1}{x}$ is an equation of the type.....

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

Watch Video Solution

415. The solution of the differential equation $ydx + (x + xy)dy = 0$ is .....

Watch Video Solution

416. Fill ups

The general solution of the differential equation `(dy)/(dx)+ (cotx)y=x, 0

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417. The solution of the differential equation $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{(1+x^2)^2}$ is

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418. Form the differential equation of all non-horizontal lines in a plane.

Watch Video Solution

419. True or false:

Order of the differential equation $\frac{dy}{dx} + y\tan x = x^2$ is one.

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420. Degree of differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = 0$ is .....

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421. True or false:

The function $F(x, y) = y \sin\left(\frac{y}{x}\right) - x$ is a homogenous function of degree 1.

Watch Video Solution

422. True or false:

The differential equation $\frac{dy}{dx} = \frac{y \cos\left(\frac{y}{x}\right) + x \sin x\left(\frac{y}{x}\right)}{x \cos\left(\frac{y}{x}\right)}$ is a homogenous differential equation.

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423. $F(x, y) = \dfrac{y\cos\left(\frac{y}{x}\right) + x}{x\cos\left(\frac{y}{x}\right)}$ is not a homiogeneous function.

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424. $\dfrac{dy}{dx} + y = 5$ is a differential equation of the type $\dfrac{dy}{dx} + Py = Q$ but it can be solved using variable separble method also.

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425. Order of the differential equation representing the family of ellipse having centre of origin and foci on x-axis is two.

Watch Video Solution

426. True or false:

Order of the differential equation of the family of all non vertical lines is one.

Watch Video Solution

427. True or false:

Order of the differential equation of the family of all non horizontal lines in a plane is one.

Watch Video Solution

428. $F(x, y) = \frac{x^2 + y^2}{x - y}$ is a homogeneous function of degree 1.

Watch Video Solution

429. Degree of the differential equation $\sqrt{1+\frac{d^2y}{dx^2}}=x+\frac{dy}{dx}$ is not defined.

Watch Video Solution

430. $\frac{dy}{dx}+y=5$ is a differential equation of the type $\frac{dy}{dx}+Py=Q$ but it can be solved using variable separble method also.

Watch Video Solution

431. Integrating factor of the differential equation $\frac{dy}{dx}-y=\cos x$ is .....

Watch Video Solution

432. True or false:

$y = 3\sin x + 4\cos x$ is a particular solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$

Watch Video Solution

433. True or false:

$y = a\sin x + b\cos x,\ a \in R,$ is the general solution of the differential equation $\frac{d^2y}{dx^2} + y = 0.$

Watch Video Solution

434. True or false:

$y = x$ is a particular solution of the differntial equation $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$

Watch Video Solution

435. The general solution of the differential equation $\frac{dy}{dx} + y\sec x = \tan x$ is

$y(\sec x - \tan x) = \sec x - \tan x + x + k.$

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436. True or false:

A homogenous differntial equation can be solved by the substitution $y = vx$.

Watch Video Solution

437. True or false:

$y = 13e^{x} + 4e^{-x}$ is a particular solution of the differential equation $\frac{d^2y}{dx^2} - y = 0$

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438. The general solution of the differential equation $x\left(1+y^2\right)dx + y\left(1+x^2\right)dy = 0$ is $\left(1+x^2\right)\left(1+y^2\right) = k.$

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439. True or false:

$x + y\tan^{-1} y$ is a solution of the differential equation

$y^2 \frac{dy}{dx} + y^2 + 1 = 0.$

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440. True or false:

The differential equation $\frac{d^2x}{dy^2} = 0$ represents a family of straight line.

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441. Number of arbitrary constants in the particular solution of a differential equation of order two is :

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442. Form the differential equation of the family of circles having their centres at the origin.

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443. The differential equation representing the family of circles $x^2 + (y - a)^2 = a^2$ will be of order two.

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444. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and b: $y = e^x(a \cos x + b \sin x)$

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445. show: The solution of $\frac{dy}{dx} = \left(\frac{y}{x}\right)^{\frac{1}{3}}$ is $y^{\frac{2}{3}} - x^{\frac{2}{3}} = c.$

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446. True or false:

Differential equation of the family of rectangular hyperbolas represented by $xy = k^2$ is $x\frac{dy}{dx} + y = 0.$

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447. True or false:

Solution of the differential equation $\frac{dx}{dy} + P_1 x = q_1$, where both P_1 and q_1 are functions of y only, is given by $xe^{\int p_1 dy} = \int \left(q_1 e^{\int P_1 dy}\right) dy + C.$

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448. True or false:

Differential equation of the family of all circles of radius 1 is of order one.

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449. show: The solution of the differential equation $\frac{dy}{dx} = \frac{x+2y}{x}$ is $x + y = kx^2$.

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450. True or false:

The general solution of the differential equation $x\frac{dy}{dx} = y + x\tan\left(\frac{y}{x}\right)$ is $\sin\left(\frac{y}{x}\right) = Cx$

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451. True or false:

The general solution of the differential equations $\frac{dy}{dx} + y = 0$ is $y = Ce^x$

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452. True or false:

The general solution of the differential equation $\frac{dy}{dx} - y = 0$ is $y = Ce^{-x}$.

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453. True or false:

A differential equation of the form $\frac{dy}{dx} = g(x, y)$ where $g(x, y)$ is a homogenous function of degree zero, can be solved by the substitution $y = vx$.

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454. True or false:

An integrating factor for the differential equation $\frac{dx}{dy} + P_1 x = q_1$, where P_1 and q_1 are function of y only is $e^{\int p_1 dy}$.

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455. True or false:

$y(\sec x + \tan x) = \sec x + \tan x - x + 108$ is a particular solution of the differential equation $\frac{dy}{dx} + y \sec x = \tan x$.

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456. Solve the differential equations:

$(x + y)(dx - dy) = dx + dy$

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457. Match the statements in column I with those given in column II.

Column I	Column II
1. Degree of the differential equation $\frac{d^2y}{dx^2} = e^{\frac{dy}{dx}}$ is	(p) 1
2. Order of the differential equation $\left(\frac{dy}{dx}\right)^2 + \frac{d^3y}{dx^3} = 0$ is	(q) $\frac{1}{x^2}$
3. Degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 = x^2$ is	(r) $\frac{1}{x}$
4. An integrating factor for the differential equation $x\,dy - y\,dx = x$	(s) $y = 2e^x - 1$
5. An integrating factor for the differential equation $\frac{dy}{dx} - \left(\frac{1}{x}\right)y = \frac{1}{x}$ is	(t) $y = xe^{-x} + 1$
6. The solution of $\frac{dy}{dx} + y = e^{-x}$, $y(0) = 1$ is	(u) not defined
7. The solution of $\frac{dy}{dx} - y = 1$, $y(0) = 1$ is	(v) 3

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458. The order of the differential equation

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

A. 3

B. 1

C. 4

D. none of these

Answer:

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459. The degree of the differential equation $\frac{d^3y}{dx^3} + \left(\frac{d^2y}{dx^2}\right)^2 - \left(\frac{dy}{dx}\right)^3 = \sin^2 x$ is

A. 3

B. 1

C. 2

D. none of these

Answer:

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460. Degree of the differential equation

$$\frac{d^2y}{dx^2}\sin\left(\frac{dy}{dx}\right) = \cos^3 y \text{ is}$$

A. 1

B. 2

C. 0

D. not defined

Answer:

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461. Degree of the differential equation $\log\left(\frac{dy}{dx}\right)^2 = 2x + 7y$ is

A. 2

B. 1

C. 0

D. not defined

Answer:

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462. The degree of the differential equation

$$\frac{d^2y}{dx^2} + x\left(\frac{dy}{dx}\right)^2 = 2x^2 \log\left(\frac{d^2y}{dx^2}\right) \text{ is}$$

A. 1

B. 2

C. 3

D. not defined

Answer:

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463. The degree of the differntial equation $\left(1+\frac{dy}{dx}\right)^3=\left(\frac{d^2y}{dx^2}\right)^3$ is

A. 1

B. 2

C. 3

D. none of these

Answer:

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

A. 1,2

B. 2,2

C. 2,1

D. 4,2

Answer:

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465. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^5+\left(\frac{dy}{dx}\right)^3=x\sin x\left(\frac{dy}{dx}\right)$ is

A. 5

B. 2

C. 3

D. not defined

Answer:

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466. The order of the differential equation of all circles of given radius a is:

A. 1

B. 2

C. 3

D. 4

Answer:

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467. The order and degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{\frac{1}{4}} + x^{\frac{1}{5}} = 0$ respectively, are

A. 2 and 2

B. 2 and 3

C. 3 and 3

D. 2 and 4

Answer:

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468. The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}=5\frac{d^2y}{dx^2}$ is

A. 4

B. $\frac{3}{2}$

C. 2

D. none of these

Answer:

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469. Solve the differential equations:

$\frac{d^2y}{dx^2}=0.$

A. y=0

B. y=ax

C. y=ax+b

D. none of these

Answer:

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470. The solution of the differential equation $2x.\frac{dy}{dx}-y=3$ represents a family are

A. straigth lines

B. circles

C. parabolas

D. ellipses

Answer:

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471. Integrating factor of the differential equation $\frac{dy}{dx} + y\tan x - \sec x = 0$ is

A. cosx

B. tanx

C. secx

D. sinx

Answer:

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472. Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx} - xy = 1d$ is

A. $-x$

B. $\frac{x}{1+x^{20}}$

C. $\sqrt{1-x^2}$

D. $\frac{1}{2}\log(1-x^2)$

Answer:

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473. Find the general solution of the differential equation:

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

A. $y = \frac{x^2 + C}{4x^2}$

B. $y = \frac{x^2}{4} + C$

C. $y = \frac{x^4 + C}{x^2}$

D. $y = \frac{x^4 + C}{4x^2}$

Answer:

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474. If $y = e^{-x}(A\cos x + B\sin x)$ then y is a solution of

A. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0$

B. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$

C. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$

D. $\frac{d^2y}{dx^2} + 2y = 0$

Answer:

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475. The complete solution of the differential equation $\frac{dy}{dx} = 2x + 5$ is

A. $x^2 + 5x$

B. $x^2 + 5x + 1$

C. $x^2 + 5x + 2$

D. $x^2 + 5x + C$, C being any constant

Answer:

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476. The differential equation for $y = A\cos\alpha x + B\sin\alpha x$ where A and B are arbitrary constants is

A. `(d^2y)/(dx^2)-alpha^2y=0

B. $\frac{d^2y}{dx^2} + \alpha^2 y = 0$

C. $\frac{d^2y}{dx^2} + \alpha y = 0$

D. $\frac{d^2y}{dx^2} - \alpha y = 0$

Answer:

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477. Which of the following is not a homogneous function x and y?

A. $x^2 + 2xy$

B. $2x - y$

C. $\cos^2\left(\frac{y}{x}\right) + \frac{y}{x}$

D. $\sin x - \cos y$

Answer:

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478. Solution of the differential equation $\frac{dy}{x} + y\frac{dy}{y} = 0$ is

A. `1/x+1/y=C

B. $\log x \log y = C$

C. xy=C

D. x+y=C

Answer:

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479. Which of the following is a second order differential equation:

A. $(y')^2 + x = y^2$

B. $y'y'' = \sin x - y$

C. $y''' + (y'')^2 + y = 0$

D. $y' = y^2$

Answer:

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480. Solution of differential equation $xdy - ydx = 0$ represents

A. a rectangular hyperbola

B. a parabika whose vertex is at origin

C. a straight line passing through origin

D. a circle centre is at the origin.

Answer:

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481. The solution of $\frac{dy}{dx} + y = e^{-x}, y(0) = 0$ is

A. $y = e^{x}(x - 1)$

B. $y = xe^{-x}z$

C. $y = xe^{-x} + 1$

D. y=(x+1)e^-x`

Answer:

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482. Solution of the differential equation $\tan y \sec^2 x dx + \tan x \sec^2 y dy = 0$ is

A. tanx+tany=k

B. $y = xe^{-x}$

C. $\frac{\tan x}{\tan y} = k$

D. tanxtany=k`

Answer:

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483. Family $Y = Ax + A^3$ of curves is represented by the differential equation of degree

A. 1,3

B. 2,2

C. 3,2

D. 4,1

Answer:

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484. Integrating factor of $x\frac{dy}{dx} - y = x^4 - 3$ is

A. x

B. logx

C. $\frac{1}{x}$

D. $-x$

Answer:

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485. The solution of $\frac{dy}{dx} - y = 1, y(0) = 1$ is given by

A. $xy = -e^x$

B. $xy = -e^{-x}$

C. $xy = -1$

D. $y = 2e^x - 1$

Answer:

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486. The number of solutions of $\frac{dy}{dx} = \frac{y+1}{x-1}$ when $y(1) = 2$ is r.

A. one

B. two

C. none

D. infinite

Answer:

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487. Find the second order derivative of the following functions

If $y = ae^{mx} + be^{-mx}$, prove that $\frac{d^2y}{dx^2} - m^2y = 0$

A. $\frac{dy}{dx} + my = 0$

B. $\frac{dy}{dx} - my = 0$

C. $\frac{d^2y}{dx^2} - m^2y = 0$

D. $\frac{d^2y}{dx^2} + m^2y = 0$

Answer:

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488. The order and degree of the differential equation $\frac{d^4y}{dx^4} = y + \left(\frac{dy}{dx}\right)^4$ are respectively.

A. 2,4

B. 4,1

C. 4,2

D. 2,2

Answer:

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489. $\tan^{-1} x + \tan^{-1} y = c$ is the general solution of the differential equation:

A. $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$

B. $\frac{dy}{dx} = \frac{1+x^2}{1+y^2}$

C. $\left(1+x^2\right)dy + \left(1+y^2\right)dx = 0$

D. $\left(1+x^2\right)dx + \left(1+y^2\right)dy = 0$

Answer:

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490. The differential equation $y\frac{dy}{dx} + x = c$ represents

A. a family of hyperbolas

B. a family of parabolas

C. a family of ellipses

D. a family of circles.

Answer:

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491. The general solution of $e^x \cos y dx - e^x \sin y dy = 0$ is

A. `e^x cosy=k

B. $e^x \sin y = k$

C. $e^x = k \cos y$

D. $e^x = k \sin y$

Answer:

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492. Find the general solution of the differential equation $\left(\frac{dy}{dx}\right) = \frac{1+y^2}{1+x^2}$

A. $y = \tan^{-1} x$

B. $y - x = k(1 + xy)$

C. $x = \tan^{-1} y$

D. $\tan(xy) = k$

Answer:

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493. The solution of the differntial equations cosx sinydx+sinx cosy dy=0 is

A. $\frac{\sin x}{\sin y} = C$

B. $\sin x \sin y = C$

C. $\sin x + \sin y = C$

D. cosxcosy=C

Answer:

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494. The solution of $x\frac{dy}{dx} + y = e^x$ is

A. $y = \left(\frac{e^x}{x} + \frac{k}{x}\right)$

B. $y = xe^x + Cx$

C. $y = xe^x + k$

D. $x = \frac{e^y}{y} + \frac{k}{y}$

Answer:

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495. True or false:

Order of the differential equation of the family of all non vertical lines is one.

A. $x\frac{dy}{dx} + y = 0$

B. $x + \frac{dy}{dx} = 0$

C. $\frac{dy}{dx} = y$

D. $x\frac{dy}{dx} - y = 0$

Answer:

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496. The differential equation for the family of circle $x^2 + y^2 - 2ay = 0$ where a is an arbitary constant is :

A. $\left(x^2 - y^2\right)\frac{dy}{dx} = 2xy$

B. $2\left(x^2 - y^2\right)\frac{dy}{dx} = xy$

C. $2\left(x^2 - y^2\right)\frac{dy}{dx} = xy$

D. $\left(x^2 + y^2\right)\frac{dy}{dx} = 2xy$

Answer:

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497. The general solution of $\frac{dy}{dx} = 2xe^{x^2 - y}$ is

A. $e^{x^2} - y = C$

B. $e^{-y} + e^{x^2} = C$

C. $e^{y} = e^{x^2} + C$

D. $e^{x^2} = C$

Answer:

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498. The general solution of the differential equation $\frac{dy}{dx} = e^{\frac{x^2}{2}} + xy$ is

A. $y = Ce^{-x^2}$

B. $y = Ce^{\frac{x^2}{2}}$

C. $y = \left(x + C\left(e^{\frac{x^2}{2}}\right)\right)$

D. $y = (C - x)e^{x^2}$

Answer:

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499. General solution of $\frac{dy}{dx} + y\tan x = \sec x$ is

A. ysecx=tanx+C

B. ytanx=secx+C

C. tanx=ytanx+C

D. xsecx+tany+C

Answer:

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500. The curve for which the slope of the tangent at any point is equal to the ratio of the abscissa to the ordinate of the point is

A. an ellipse

B. parabola

C. circle

D. rectangular hyperbola

Answer:

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501. The solution of the equation $(2y-1)dx-(2x+3)dy=0$ is

A. $\frac{2x-1}{2y+3}=k$

B. $\frac{2y+1}{2x-3}=k$

C. $\frac{2x+3}{2y-1}=k$

D. $\frac{2x-1}{2y-1}=k$

Answer:

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502. The order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^2-3\frac{d^2y}{dx^2}+2\left(\frac{dy}{dx}\right)^4=y^4$ are

A. 1,4

B. 3,4

C. 2,4

D. 3,2

Answer:

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503. Which of the following is the general solution of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 0$?

A. $y(Ax + B)e^x$

B. $y = (Ax + B)e^{-x}$

C. $y = Ae^x + Be^{-x}$

D. $y = A\cos x + B\sin x$

Answer:

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504. Solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = \sin x$ is

A. x(y+cosx)=sinx+C

B. x(y-cosx)=sinx+C

C. xycosx=sinx+C

D. x(y+cosx)=cosx+C

Answer:

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505. Find the particular solution of : $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$, given that x=1, y=1.

A. $y = e^{x-y} - x^2 e^{-y} + C$

B. $e^y - e^x = \frac{x^3}{3} + C$

C. $e^x + e^y = \frac{x^3}{3} + C$

D. $e^x - e^y = \frac{x^3}{3} + C$

Answer:

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506. The general solution of the differential equation $e^x dy + (ye^x + 2x)dx = 0$ is:

A. $y + 1 = k(e^x - 1)$

B. $y + 1 = e^x + 1 + k$

C. $y = \log\{k(y + 1)(e^x + 1)\}$

D. $y = \log\left(\frac{d^x + 1}{y + 1}\right) + k$

Answer:

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507. The solution of the differential equation $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{(1+x^2)^2}$ is

A. $y(1+x^2) = C + \tan^{-1} x$

B. $\frac{y}{1+x^2} = C + \tan^{-1} x$

C. $y \log(1+x^2) = C + \tan^{-1} x$

D. $y(1+x^2) = C + \sin^{-1} x$

Answer:

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