



MATHS

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DIFFERENTIAL EQUATION

Example

1. Write the order and degree of the

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

.



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2. Write the degree of the differential

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



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



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4. If p and q are the order and degree of the differential equation

$$y \left(\frac{dy}{dx} \right)^2 + x^2 \frac{d^2y}{dx^2} + xy = \sin x, \quad \text{then}$$

choose the correct statement out of

$$p = q$$

A. $p > q$

B. $p = q$

C. $p < q$

D.

Answer:



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5. What is the solutions of the differential

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



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6. What is the solution of $\frac{dy}{dx} = \cos(x - y)$



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7. Find the particular solution of the differential equation $\frac{d^2y}{dx^2} = 6x$, given that $y = 1$ and $\frac{dy}{dx} = 2$, when $x = 0$ at Y-axis.



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8. Solve the following differential equation

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



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9. Solve the following differential equation :

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



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10. Obtain the differential equation whose primitive is $y = Ae^{2x} + Be^{-2x}$.



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11. Solve $\frac{dy}{dx} = \cos 2x \cos x$, if $y=2$, when $x = 0$.



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12. Solve $\frac{dy}{dx} = \frac{1 + y^2}{\sqrt{1 - x^2}}$ if $y = 1$ when $x = 1$



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13. Write the particular solution of

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



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14. Write the differential equation of circles passing through the origin and having their centre on the x-axis.



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15. Find the general solution of the differential equation $(1 + y^2) \frac{dx}{dy} + (x - e^{\tan^{-1} y}) = 0$.



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16. What is the solution of the equation

$$\frac{d^2y}{dx^2} = e^{-(2x)}?$$



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17. What is the general solution of

$$\frac{dy}{dx} = x + xy?$$



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18. Form the differential equation representing the family of curves

$$y = a \cos(x + b).$$



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19. Form the differential equation from $y = c \sec x$ by eliminating the arbitrary constant.



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20. What is the general solution of the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2}$.



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21. Write the differential equation of the family of straight lines parallel to the Y-axis.



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22. Write the order and degree of the differential equation in $\frac{d^2y}{dx^2} = y$



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23. What is the solution of $xdx + ydy = 0$?



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24. What is the differential equation whose solution is $y = mx + c$.



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25. What is the order of the differential equation of all conics whose centre is at origin ?



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26. What is the order of the differential equation of all conics whose axes coincide with the axes of coordinates.





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27. Write the order of the differential equation whose general solution is $y = ax^2 + b$, where a and b are arbitrary constants.



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28. Write the particular solution of the equation $\frac{dy}{dx} = \sin x$ given that $y(\pi) = 2$.



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29. Write the order and the degree of the following differential equation.

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



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30. Write the particular solution of

$$\frac{dy}{dx} = (1 + x)^4, y = 0 \text{ when } x = -1.$$



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31. The differential equation of the family of straight lines passing through origin is_____.



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32. Obtain a differential equation that should be satisfied by the family of concentric circles $x^2 + y^2 = a^2$.



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33. Form the differential equation , whose solution is $y = e^{x+a}$



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34. Write the particular solution of

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



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35. Given the general solution as $y = (x^2 + c)e^{-x}$ of a differential equation, what is the particular solution if $y = 0$ when $x = 1$.



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36. What is the order of the differential equation of all circles of radius r having centre on y -axis and passing through the origin ?



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37. If the homogeneous form of the differential equation $\frac{dy}{dx} = \frac{x + y + 1}{x - y + 1}$ is $\frac{dY}{dX} = \frac{X + Y}{X - Y}$ then what is the relation between Y and y ?



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38. Write the differential equation of the parabola $y^2 = 4x + 10$.



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39. What is the differential equation whose general solution is $y = 3x + k$.



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40. Write the solution of the equation

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



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41. Write the order and degree of the

differential equation $\left(\frac{dy}{dx}\right)^8 + \left(\frac{d^2y}{dx^2}\right) = 0$



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42. Write the solution of $\frac{dy}{dx} = 8x$ given $y = 1$

when $x = 2$.



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43. How many arbitrary constants does the general solution of the differential equation

$$\frac{d^2y}{dx^2} = \sin x + \cos x \text{ contains?}$$



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44. Find the order and degree of a the

differential equation $\left(\frac{dy}{dx}\right)^4 + y^5 = \frac{d^3y}{dx^3}$.



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45. If p and q are respectively degree and order of the differential equation $y = e^{dy/dx}$, then write the relation between p and q .



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46. From the differential equation whose general solution is $y = a \sin t + be^t$.



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47. Find the particular solution of the following differential equation:

$$\left(\frac{dy}{dx}\right) = \frac{1 + y^2}{1 + x^2} \text{ given that } y = \sqrt{3} \text{ when } x = 1$$



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48. Solve the following differential equations

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



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49. Solve the following second order equations

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



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



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51. Obtain the general solution of the following differential equations.

$$ydy + e^{-y}x \sin x dx = 0$$



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



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53. Solve the following differential equations

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



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54. Solve $x^2(y - 1)dx + y^2(x - 1)dy = 0$



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55. Find the particular solution of the

differential equation $\frac{d^2y}{dx^2} = 6x$ given that

$y = 1$ and $\frac{dy}{dx} = 2$ when $x = 0$.



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56. Solve : $(x + y)dy + (x - y)dx = 0$.



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57. Find the integrating factor of the differential equation.

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



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58. Solve: $\frac{dy}{dx} = \frac{1}{x^2 - 7x + 12}$



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59. Find the differential equation whose general solution is $y = at + be^t$



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60. Find the differential equation whose general solution is $ax^2 + by = 1$, where a and b are arbitrary constants.



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61. Solve $\frac{dy}{dt} = t^2$.



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62. Solve $\frac{dy}{dt} = e^{2t}$



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63. Solve the following differential equations.

$(x + \tan y)dy = \sin 2y dx$





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



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65. Solve $\frac{dy}{dx} = e^{-x}$.



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66. Find the differential equation whose general solution is $ax^2 + by = 1$, where a and b are arbitrary constants.



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67. Find the particular solution of the following differential equation :

$$\frac{dy}{dx} + \frac{1 + y^2}{1 + x^2} = 0, y(-1) = -\sqrt{3}$$



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68. Find an integrating factor of the differential equation $(x + \tan y) dy = \tan y dx$.



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69. Write integrating factor of $(1 + y^2) dx + x dy = \tan^{-1} y dy$



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70. Reduce the following to a linear differential equation $x \frac{dy}{dx} + y = xy^2$.



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71. Write the order and degree of the following differential equation

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



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72. Find the differential equation whose general solution is $y = at + be^t$



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73. Solve $\frac{dy}{dx} = 4y$.



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74. Write the differential equation of all non-horizontal lines in a plane.



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75. Find the integrating factor for the solution of the differential equation

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



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76. Find the differential equation whose general solution is $y = a \cos x + b \sin x$.



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77. Write the order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2} + \frac{dy}{dx}\right)^5 + \left(\frac{d^3y}{dx^3}\right)^2 = x^4 \sqrt{3\frac{d^3y}{dx^3} + 1}$$



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78. Obtain the differential equation whose primitive is $y = Ae^{2x} + Be^{-2x}$.



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79. Find the factor that should be multiplied with the differential equation $\cos x \frac{dy}{dx} + y \sin x = 3$ to make it integrable.



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80. Find the differential equation whose general solution is $ax^2 + by = 2$



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81. Solve: $(1 + x^2)dy = (1 + y^2)dx$



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82. Find integrating factor of

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



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83. Write the integrating factor of

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



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84. Form the differential equation whose general solution is $y = ae^x + bx$



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85. Reduce the following to a linear differential equation $x \frac{dy}{dx} + y = xy^2$.



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86. Form the differential equation by eliminating the arbitrary constants in each of the following cases.

$$y = A \sec x$$



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87. Write the particular solution of $\frac{dy}{dx} = 8x$, given that $y=2$, when $x=1$.



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88. Form the differential equation , whose solution is $y = e^{x+a}$



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89. Find the solution of $\frac{d^2y}{dx^2} = 3x^2 + 1$ given that $y = 2$ and $\frac{dy}{dx} = 4$ when $x = 0$.



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90. Solve $\frac{dy}{dx} = \cos x, y(0) = 1$



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91. Write the integrating factor of the differential equation

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



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



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93. Find the particular solution of the differential equation

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

that $x = 0$ when $y = \frac{\pi}{2}$.



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94. Find the solution of the following differential equations:

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



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95. Solve the following differential equation:-

$$\frac{dy}{dx} = \frac{3x - 7y + 7}{3y - 7x - 3}$$



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96. Find the solution of the following differential equations:

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



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97. Solve the following differential equation:-

$$\frac{d^2y}{dx^2} = \frac{1}{x(x+1)} + \operatorname{cosec}^2 x$$



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98. Solve the following differential equation:-

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



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99. Solve the following differential equation:-

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



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100. Solve the following differential equation:-

$$\frac{d^2y}{dx^2} = 4e^x + x \cos x + \sec^2 x \quad \text{Given that}$$

$$y(0) = 2, y'(0) = 4.$$



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101. Solve the following differential equation:-

$$\frac{dy}{dx} + 2y \tan x = \sin x, y\left(\frac{\pi}{3}\right) = 0$$



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102. Solve the following differential equation:-

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



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103. Obtain the general solution of the following differential equations.

$$ydy + e^{-y}x \sin x dx = 0$$



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104. Solve the following differential equation:-

$$\frac{d^2y}{dx^2} = \sin 3x.$$



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105. Solve the following differential equation:-

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



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106. Solve the following differential equation:-

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



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107. Solve the following differential equation:-

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



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108. Solve the following differential equation:-

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



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109. Solve the following differential equation:-

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



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110. Solve the following differential equation:-

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



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111. Solve the following differential equation:-

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



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112. Solve the following differential equation:-

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



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113. Solve the following differential equation:-

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



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114. Solve the following differential equation:-

$$\frac{dy}{dx} = \frac{4x^3 + 6x}{x^4 + 3x^2 + 1}$$



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115. Solve the following differential equation:-

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



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116. Solve the following differential equation:-

$$e^{-x} \frac{d^2y}{dx^2} = x, y = 3 \text{ and } \frac{dy}{dx} = 2 \text{ when } x = 0.$$



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117. Solve the following differential equation:-

$$\frac{dy}{dx} = \frac{x \ln x}{3y^2 + 4y}, \text{ Given that } y = 4 \text{ when } x = 0$$



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118. Solve the following differential equation:-

$$\frac{dy}{dx} = \frac{1 + y^2}{\sqrt{1 - x^2}} \text{ if } y = 2 \text{ when } x = 0.$$



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119. Solve the following differential equation:-

$$\frac{d^2y}{dx^2} = xe^x, y(0) = 1, y^1(0) = 1$$



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120. Solve the following differential equation:-

$$\frac{d^2y}{dx^2} = 3x^2 - x + 1, y(0) = 0, y^1(0) = 1$$



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121. Solve:- $\frac{dy}{dx} + (xy) = xy^2$



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122. Solve :- $(x^2 + y^2)dx - 2xydy = 0$



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



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124.

Solve

∴

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



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