MATHS

BOOKS - A N EXCEL PUBLICATION

DIFFERENTIAL EQUATIONS

Question Bank

1. Find the order and degree (if defined) of the following differential equations. $\frac{d^4y}{dx^4}$ + sin (y''') = 0

Watch Video Solution

2. Find the order and degree (if defined) of the following differential equations. y' + 5y = 0

Watch Video Solution

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

Watch Video Solution

4. Find the order and degree (if defined) of the following differential equations. $\left(\frac{d^2y}{dx^2}\right)^2 + \cos\left(\frac{dy}{dx}\right) = 0$

Watch Video Solution

5. Find the order and degree (if defined) of the following differential equations. $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$

Watch Video Solution

6. Determine order and degree (if defined) of the following differential equations . $(y''')^2 + (y'')^3 + (y')^4 + y^5 = 0$

Watch Video Solution

7. Determine order and degree (if defined) of the following differential equations y''' + 2y'' + y' = 0

Watch Video Solution

8. Determine order and degree (if defined) of the following differential equations y' +y =e^x

Watch Video Solution

9. Determine order and degree (if defined) of the following differential equations y'' + $(y)^2$ + 2y = 0

Watch Video Solution

10. Determine order and degree (if defined) of the following differential equations y'' + 2y' + sin y = 0

Watch Video Solution

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

A. 3

B. 2

C. 1

D. not defined

Answer: D

Watch Video Solution

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

A. 2

B. 1

C. 0

D. not defined

Answer: A

Watch Video Solution

13. Check whether $y = e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$

Watch Video Solution

14. $y = a\cos x + b\sin x$ is the solution of the differential equation

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

Watch Video Solution

15. Verify that the given function (explicit or implicit) isa solution of the correseponding differential equation : $y = e^x + 1$: y'' - y' = 0

Watch Video Solution

16. Verify that the given function (explicit or implicit) isa solution of the correseponding differential equation : $y = x^2 + 2x + c$:y' - 2x - 2 = 0

Watch Video Solution

17. Verify that the given function (explicit or implicit) isa solution of the corresponeding differential equation : y = cos x + c : y' + sin x = 0

Watch Video Solution

18. Verify that the given function (explicit or implicit) isa solution of the corresponeding differential equation : $y = \sqrt{1 + x^2} : y' = \frac{xy}{1 + x^2}$

Watch Video Solution

19. Verify that the given function (explicit or implicit) is a solution of the corresponeding differential equation : y = Ax : $xy' = y(x \neq 0)$

Watch Video Solution

20. Verify that the given function (explicit or implicit) is a solution of the corresponeding differential equation : y = x sin x : xy' = y+$x\sqrt{x^2 - y^2}$(x ne 0 and x gt y or x lt -y)`

Watch Video Solution

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

Watch Video Solution

22. Verify that the given function (explicit or implicit) is a solution of the correseponding differential equation : y- cos y = x : (y sin y + cos y + x) y' = y

Watch Video Solution

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

Watch Video Solution

24. Verify that the given function (explicit or implicit) is a solution of the corresponseponding differential equation : y = $\sqrt{a^2 - x^2}, x \in (-a, a) : x + y\frac{dy}{dx} = 0 (y \neq 0)$

Watch Video Solution

25. Choose the correct answer. The number of arbitrary constains in the general solution of a differential equation of fourth order is

A. 0

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

26. Choose the correct answer. The number of arbitrary constants in the perticular solution of a different equation of third order is

A. 3

B. 2

C. 1

D. 0

Answer: D

Watch Video Solution

27. Form the differential equation corresponding to the curve $y = mx$

Watch Video Solution

28. From the differential equation of the family of curves represented by $y^2 = (x - c)^3$

Watch Video Solution

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

Watch Video Solution

30. Form the DE of the family of ellipse having foci on the x-axis and centre at the origin.

Watch Video Solution

31. Form the DE of the family of circles touching the x-axix at origin.

Watch Video Solution

32. Form the DE representing the family of parabolas having vertex at origin and axis along positive direction of x-axis.

Watch Video Solution

33. From a differential equation representing the given family of curves by eliminating the arbitrary constains a and b

x/a + y/b = 1

Watch Video Solution

34. Find the Differential equation satisfying the family of curves $y^2 = a\left(b^2 - x^2\right)$,a and b are arbitrary constants.

Watch Video Solution

35. Find the Differential equation satisfying the family of curves $y = ae^{3x} + be^{-2x}$,a

and b are arbitrary constants.

Watch Video Solution

36. Find the differential equation satisfying $y = e^{2x}(a + bx)$,a and b are arbitrary constants.

Watch Video Solution

37. Find the differential equation satisfying $y = e^{x}(a\cos x + b\sin x)$,a and b are arbitrary constants..

Watch Video Solution

38. Form the differential equation of the family of all circles touching the y-axis at origin.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

43. Choose the correct answer . Which of the following differential equation 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: B

Watch Video Solution

44. Choose the correct answer . Which of the following differential equation has y = x as one of its particular solution ?

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

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: C

Watch Video Solution

45. Find the general solution of the differential equation $\frac{dy}{dx} = \frac{x+1}{2-y}(y \neq 2)$

Watch Video Solution

46. Find the general solution of the differential equation $\frac{dy}{dx} = \frac{1+y^2}{1-x^2}$

Watch Video Solution

47. Find the general solution of the following differential equations

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

Watch Video Solution

48. Find the general solution of the following differential equations

$$\frac{dy}{dx} = \sqrt{4 - y^2}(-2 < y < 2)$$

Watch Video Solution

49. Find the general solution of the following differential equations

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

Watch Video Solution

Watch Video Solution

50. Find the general solution of the differential equation

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

Watch Video Solution

51. Find the general solution of the following differential equation

'(e^x + e^-x)dy - (e^x - e^-x)dx = 0`

Watch Video Solution

52. Find the general solution of the following differential equation

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

Watch Video Solution

53. Find the general solution of the following differential equation

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

Watch Video Solution

54. Find the general solution of the following differential equation

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

Watch Video Solution

55. Find the general solution of the following differential equation

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

Watch Video Solution

56. Find the general solution of the following differential equation

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

Watch Video Solution

57. Find a particular solution satisfying the given condition. $\left(x^3 + x^2 + x + 1\right) \frac{dy}{dx} = 2x^2 + x$ when $y = 1, x = 0$

Watch Video Solution

Watch Video Solution

58. For the following 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

59. For the following differential equation 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

60. For the following differential equation find a particular solution satisfying the given condition.

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

Watch Video Solution

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

Watch Video Solution

62. For the DE $xy\frac{dy}{dx} = (x+2)(y+2)$,find the solution curve passing through the point (1,-1).

Watch Video Solution

63. 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

64. 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).

Watch Video Solution

65. The volume of spherical ballon being inflated at a constant rate. If initially its radius is 3 units and after 3 seconds it is 6 units. Find the radius of the balloon after t seconds.

Watch Video Solution

66. In a bank, principal increases continuosly at the rate of $r\ \%$ per year. Find

the valueof r if Rs. 100 double itself in 10 years. $(\log_e 2 = 0.6931)$

Watch Video Solution

67. In a bank, principal increases continuosly 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 $\left(e^{0.5}=1.648\right)$

Watch Video Solution

68. 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 ?

Watch Video Solution

69. The general solution of the differential equation '(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: A

Watch Video Solution

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

Watch Video Solution

71. Show that the following equations are homogeneous and solve each of them.

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

Watch Video Solution

Watch Video Solution

72. Show that the following equations are homogeneous and solve each of them.

$y' = \frac{x + y}{x}$

Watch Video Solution

73. Show that the following equations are homogeneous and solve each of them.

(x - y)dy - (x + y)dx = 0

Watch Video Solution

74. Show that the following equations are homogeneous and solve each of them.

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

Watch Video Solution

75. Solve the DE $x^2 \frac{dy}{dx} = x^2 - 2y^2 + xy$

Watch Video Solution

76.

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

Watch Video Solution

77. Show that the following equations are homogeneous and solve each of them.

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

Watch Video Solution

78. Show that the following equations are homogeneous and solve each of them.

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

Watch Video Solution

79. Show that the following equations are homogeneous and solve each of them.

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

83. Find the particular solution of the following equation satisfying the given condition.

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

Watch Video Solution

84. Find the particular solution of the following equation 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

85. 2 x y+y^2-2 x^2 (dy)/(dx)=0 , y=2' when 'x=1'

Watch Video Solution

86. 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

A. y = vx

B. v = yx

C. x = vy

D. x = v

Answer: C

Watch Video Solution

87. Which of the following is a homogeneous differential equation? $(4x + 6y + 5)dy - (3y + 2x + 4)dx = 0$

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

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

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

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

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

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

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

Answer: D

Watch Video Solution

88. Find the general solution of the differential equation

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

Watch Video Solution

89. 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 of that point.

Watch Video Solution

90. Consider the differential equation $\frac{dy}{dx} + y\tan x = \sec x$

Find the I.F.

Watch Video Solution

91. Consider the differential equation $\frac{dy}{dx} + y\tan x = \sec x$

Find the general solution of the given equation.

Watch Video Solution

92. Consider the differential equation $\frac{dy}{dx} + y\tan x = \sec x$

Find the solution of the equation satisfying $y\left(\frac{\pi}{4}\right) = 1$

Watch Video Solution

93. Consider the D.E $\left(x^2 - 1\right)\frac{dy}{dx} + 2(x+2)y = 2(x+1)$

Find dy/dx,degree and order of the above

differential equation.

Watch Video Solution

94. Consider the D.E $\left(x^2 - 1\right)\frac{dy}{dx} + 2(x+2)y = 2(x+1)$

Find the integrating factor of the above

diffrential equation.

Watch Video Solution

95. Consider the differential equation $(x^2-1)\frac{dy}{dx}+2(x+2)y=2(x+1)$

Solve the differential equation.

Watch Video Solution

96. Consider the differential equation $y^2+\left(x-\frac{1}{y}\right)\frac{dy}{dx}=0$

Find $\frac{dx}{dy}$

Watch Video Solution

97. Consider the differential equation $y^2+\left(x-\frac{1}{y}\right)\frac{dy}{dx}=0$

Convert the equation into a linear equation with x as

dependent variable and find the integrating factor

Watch Video Solution

98. Consider the differential equation $y^2 + \left(x - \frac{1}{y}\right)\frac{dy}{dx} = 0$

Solve the given differential equation

Watch Video Solution

99. Solve the following differential equations $\frac{dy}{dx} + 2y = \sin x$

Watch Video Solution

100. Solve the following differential equations $\frac{dy}{dx} + 3y = e^{-2x}$

Watch Video Solution

101. Solve the following differential equations $\frac{dy}{dx} + \frac{y}{x} = x^2$

Watch Video Solution

102. Solve the following differential equations $\frac{dy}{dx} + \sec xy = \tan x \left(0 \leq x < \frac{\pi}{2}\right)$

Watch Video Solution

103. Solve the following differential equations $\cos^2 x \frac{dy}{dx} + y = \tan x \left(0 \leq x < \frac{\pi}{2}\right)$

Watch Video Solution

104. Find the general solution of the differential equation

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

Watch Video Solution

105. Solve the following differential equations

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

Watch Video Solution

106. Solve the following differential equations

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

Watch Video Solution

107. Solve the following differential equations

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

Watch Video Solution

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

Watch Video Solution

109. Solve the following differential equations

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

Watch Video Solution

110. Solve the following differential equations

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

Watch Video Solution

111. For each of the following differential equations, find a particular solution

satisfying the given conditions.

$$\frac{dy}{dx}+2y\tan x=\sin x, \text{y = 0 when x = } \frac{\pi}{3}$$

Watch Video Solution

112. Find the particular solution of the

differential equation

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

Watch Video Solution

113. For each of the following differential equations, find a particular solution satisfying the given conditions.

$\frac{dy}{dx}-3y\cot x=\sin 2x$, y = 2 when x = $\frac{\pi}{2}$

Watch Video Solution

114. 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 coordinate of the point.

Watch Video Solution

115. 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.

Watch Video Solution

116. Find the integrating factor of the differential equation $x\frac{dy}{dx} - y = 2x^2$

A. e^{-x}

B. e^{-y}

C. 1/x

D. x

Answer: C

Watch Video Solution

117. The intergrating 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: D

Watch Video Solution

118. Find the order and the degree of the following differential equation $\frac{d^2y}{dx^2} + 5x\left(\frac{dy}{dx}\right)^2 - 6y = \log x$

Watch Video Solution

119. Find the order and the degree of the following differential equation $\left(\frac{dy}{dx}\right)^3 - 4\left(\frac{dy}{dx}\right)^2 + 7y = \sin x$

Watch Video Solution

120. Find the order and the degree of the following differential equation $\frac{d^4y}{dx^4} - \sin\left(\frac{d^3y}{dx^3}\right) = 0$

Watch Video Solution

121. Verify that the given fuction (implicit or explicit) is a solution of the corresponding differential equation.

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

Watch Video Solution

122. For each of the exercises given below, verify that the given fuction (implicit or explicit) is a solution of the corresponding differential equation.

$$y = e^{x}(a\cos x + b\sin x) : \frac{d^{2}y}{dx^{2}} - 2\frac{dy}{dx} + 2y = 0$$

Watch Video Solution

123. Verify that the given fuction (implicit or explicit) is a solution of the corresponding differential equation.

$y = x \sin 3x : \frac{d^2y}{dx^2} + 9y - 6\cos 3x = 0$

Watch Video Solution

124. Verify that the given fuction (implicit or explicit) is a solution of the corresponding differential equation.

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

128. Find the general solution of the differential equation $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$

Watch Video Solution

129. Find the 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 = $\frac{\pi}{2}$.

Watch Video Solution

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

given that y = 0 when x = 0.

Watch Video Solution

131. 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 20000 in 1999 and

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

Watch Video Solution

132. Choose the correct . 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

A. xy = c

B. $x = cy^2$

C. y = cx

D. $y = cx^2$

Answer: C

Watch Video Solution

133. Choose the correct answer. 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) $ye^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dy + c$ c) $xe^{\int P_1 dy} = \int \left(Q_1 e^{\int P_1 dy}\right) dy + c$ d) $xe^{\int P_1 dx} = \int \left(Q_1 e^{\int P_1 dx}\right) dx + c$

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

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

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: C

Watch Video Solution

134. Choose the correct answer. The general solution of a differential equation $e^x dy + (ye^x + 2x)dx = 0$ is... a) $xe^x + x^2 = c$ b) $xe^y + y^2 = c$ c) $xe^y + y^2 = c$ d) $ye^x + x^2 = c$

A. $xe^x + x^2 = c$

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

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

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

Answer: C

Watch Video Solution