MATHS

BOOKS - OBJECTIVE RD SHARMA ENGLISH

DIFFERENTIAL EQUATIONS

Illustration

1. The degree of the differential equation

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

A. 1

B. 2

C. 3

D. none of these

Answer: D

Watch Video Solution

2. The degree of the differential equation

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

A. 1

B. 2

C. 3

D. none of these

Answer: D

Watch Video Solution

3. Find the order and degree (if defined) of the equation:

$$\left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} + 4 - 3\frac{d^2}{dx^2} + 5\frac{dy}{dx} = 0$$

A. 1

B. 2

C. 3

D. none of these

Answer: B

Watch Video Solution

4. The order and degree of the differential equation

$$\rho = \frac{\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{3/2}}{\frac{d^2y}{dx^2}}$$ are respectively

A. 2,2

B. 2,3

C. 2,1

D. none of these

Answer: A

Watch Video Solution

5. If p and q are the order and degree of the differential equation $y\frac{dy}{dx} + x^3\frac{d^2y}{dx^2} + xy = \cos x$, then

a. $p < q$ b. $p = q$ c. $p > q$ d. none of these

A. p lt q

B. p = q

C. p gt q

D. none of these

Answer: C

Watch Video Solution

6. Order and degree of the differential equation

$$\frac{d^2y}{dx^2} = \left\{y + \left(\frac{dy}{dx}\right)^2\right\}^{1/4}$$ are

A. 4 and 2

B. 1 and 2

C. 1 and 4

D. 2 and 4

Answer: D

Watch Video Solution

7. The order of the differential equation

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

A. 2

B. 3

C. $1/2$

D. 6

Answer: A

Watch Video Solution

8. If m and n are order and degree of the differential equation

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

A. m = 3, n = 3

B. m = 3, n= 2

C. m = 3, n = 5

D. m = 3, n = 1

Answer: B

Watch Video Solution

9. The solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - \frac{xdy}{dx} + y = 0$ is

(A) $y = 2$ (B) $y = 2x$ (C) $y = 2x - 4$ (D) $y = 2x^2 - 4$

A. y = 2

B. y = 2x

C. y = $2x - 4$

D. $y = 2x^2 - 4$

Answer: C

Watch Video Solution

10. The solution of the differential equation $(x^2 + 1)\frac{dy}{dx} + (y^2 + 1) = 0$ is

a. $y = 2 + x^2$

b. $y = \frac{1 + x}{1 - x}$

c. $y = x(x - 1)$

d. $y = \frac{1 - x}{1 + x}$

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

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

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

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

Answer: D

Watch Video Solution

11. If f (x) and g (x) are two solutions of the differential equation $\left(a\frac{d^2y}{dx^2}+x^2\frac{dy}{dx}+y=e^x, then$f(x)-g(x)` is the solution of

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

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

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

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

Answer: D

Watch Video Solution

12. $y = ae^{mx} + be^{-mx}$ satisfies which of the following differential equation?

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

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

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

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

Answer: D

Watch Video Solution

13. Differential equation of all parabolas having their axes of symmetry coincident with the axis of X is :

A. $yy_1^2 + y_2 = 0$

B. $yy_2 + y_1^2 = 0$

C. $y_1^2 + yy_2 = 0$

D. $yy_2 + y_1 = 0$

Answer: B

Watch Video Solution

14. Find the differential equation of all parabolas whose axis are parallel to the x-axis.

A. 2

B. 3

C. 1

D. none of these

Answer: B

Watch Video Solution

15. The differential equation of all parabolas whose axis of symmetry is along X-axis is of order.

A. 2

B. 3

C. 1

D. none of these

Answer: A

Watch Video Solution

16. The differential equation of all non-vertical lines in a plane, is

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

B. $\frac{d^2x}{dy^2}=0$

C. $\frac{dy}{dx}=0$

D. $\frac{dx}{dy} = 0$

Answer: A

Watch Video Solution

17. The differential equation of all non-horizontal lines in a plane is

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

B. $\frac{d^2x}{dy^2} = 0$

C. $\frac{dy}{dx} = 0$

D. $\frac{dx}{dy} = 0$

Answer: B

Watch Video Solution

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

A. order 1 and degree 3

B. order 2 and degree 3

C. order 1 degree 2

D. none of these

Answer: A

Watch Video Solution

19. The differential equation of all circles passing through the origin and having their centres on the x-axis is (1) $x^2 = y^2 + xy\frac{dy}{dx}$ (2) $x^2 = y^2 + 3xy\frac{dy}{dx}$ (3) $y^2 = x^2 + 2xy\frac{dy}{dx}$ (4) $y^2 = x^2 - 2xy\frac{dy}{dx}$

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

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

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

D. $x^2 = y^2 + 3xy\frac{dy}{dx}$

Answer: A

Watch Video Solution

20. The family $y = Ax + A^3$ of curves is represents by differential equation of order

A. 3

B. 2

C. 1

D. none of these

Answer: A

Watch Video Solution

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

A. $2y_1 - y = 0$

B. $2y_1 + xy = 0$

C. $xy_1 - 2y = 0$

D. $yy_1 - 2x = 0$

Answer: C

Watch Video Solution

22. Form the differential equation of family of lines concurrent at the origin.

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

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

C. $\frac{dy}{dx} = 0$

D. $\frac{dy}{dx} = x$

Answer: A

Watch Video Solution

23. The differential equation for which $y = a\cos x + b\sin x$ is a solution is

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

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

C. $\frac{d^2y}{dx^2} + (a+b)y = 0$

D. $\frac{d^2y}{dx^2} + (a-b)y = 0$

Answer: A

Watch Video Solution

24. The differential equation which represents the family of curves $y = c_1 e^{c_2 x}$ where c_1 and c_2 are arbitary constants is

A. $y' = y^2$

B. $y'' = y'y$

C. $yy'' = y'$

D. $yy'' = (y')^2$

Answer: D

Watch Video Solution

25. The differential equation of the family of circles with fixed radius 5 units and centre on the line y=2 is

A. $(y-2)^2 y'^2 = 25 - (y-2)^2$

B. $(x-2)^2 y'^2 = 25 - (y-2)^2$

C. $(x-2) y'^2 = 25 - (y-2)^2$

D. $(y-2)y'^2 = 25-(y-2)^2$

Answer: A

Watch Video Solution

26. The differential equation whose solution is $Ax^2+By^2=1$, where A and B are arbitrary constants, is of (a) second order and second degree (b) first order and second degree (c) first order and first degree (d) second order and first degree

A. second order and second degree

B. first order and second degree

C. first order and first degree

D. second order and first degree

Answer: D

Watch Video Solution

27. The general solution of the differential equation $xdy + ydx + 2x^3dx = 0$, is

A. $xy + x^4 = C$

B. $xy + \frac{1}{2}x^4 = C$

C. $x + y + \frac{1}{2}x^4 = 0$

D. $xy - \frac{1}{2}x^4C$

Answer: B

Watch Video Solution

28. The solution of differential equation $xdx + ydy = a(x^2 + y^2)dy$ is

A. $x^2 + y^2 = Ce^{ay}$

B. $x^2 + y^2 = Ce^{2ay}$

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

D. none of these

Answer: B

Watch Video Solution

29. The solution of the differential equation $(1+xy)xdy+(1-xy)ydx=0$ is

A. $\frac{1}{xy}+\log\left(\frac{y}{x}\right)=C$

B. $-xy+\log\left(\frac{y}{x}\right)=C$

C. $-\frac{1}{xy}+\log\left(\frac{y}{x}\right)=C$

D. $-\frac{1}{xy}+\log\left(\frac{x}{y}\right)=C$

Answer: C

Watch Video Solution

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

A. $\tan^{-1}\left(\frac{y}{x}\right) = -x + C$

B. $\tan^{-1}\left(\frac{y}{x}\right) = x + C$

C. $\tan^{-1}\left(\frac{x}{y}\right) = -x + C$

D. $\tan^{-1}\left(\frac{y}{x}\right) = -y + C$

Answer: A

Watch Video Solution

31. Solve the differential equation $ye^{\frac{x}{y}}dx = \left(xe^{\frac{x}{y}} + y^2\right)dy(y \neq 0)$

A. $e^{x/y} = \cos y + C$

B. $e^{x/y} = -\sin y + C$

C. $e^{y/x} = -\cos y + C$

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

Answer: C

Watch Video Solution

32. The solution of $\frac{dy}{dx} = \frac{x^2 + y^2 + 1}{2xy}$ satisfying y(1) =1 is given by

A. a hyperbola

B. a circle

C. $y^2 = x(1 + x) - 10$

D. $(x - 2)^2 + (y - 3)^2 = 5$

Answer: A

Watch Video Solution

33. The solution of the differential equation $x^3 \frac{dy}{dx} + 4x^2 \tan y = e^x \sec y$ satisfying $y(1) = 0$, is

A. $\tan y = (x - 2)e^x \log x$

B. $\sin y = e^x (x - 1)x^{-4}$

C. $\tan y = (x - 1)e^x x^{-3}$

D. $\sin y = e^{x}(x-1)x^{-3}$

Answer: B

Watch Video Solution

34. Solution of the differential equation

$$\frac{\sqrt{x}dx+\sqrt{y}dy}{\sqrt{x}dx-\sqrt{y}dy}=\sqrt{\frac{y^3}{x^3}}$$ is given by

A. $\frac{3}{2}\log\left(\frac{y}{x}\right)+\log\left|\frac{x^{3/2}+y^{3/2}}{x^{3/2}}\right|+\tan^{-1}\left(\frac{y}{x}\right)^{3/2}+C=0$

B. $\frac{2}{3}\log\left(\frac{y}{x}\right)+\log\left|\frac{x^{3/2}+y^{3/2}}{x^{3/2}}\right|+\tan^{-1}.\frac{y}{x}+C=0$

C. $\frac{2}{3}\log\left(\frac{y}{x}\right)+\log\left(\frac{x+y}{x}\right)+\tan^{-1}\left(\frac{y^{3/2}}{x^{3/2}}\right)+C=0$

D. none of these

Answer: D

Watch Video Solution

35. The solution of the differential equation $xdx + ydy + \frac{xdy - ydx}{x^2 + y^2} = 0$, is

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

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

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

D. none of these

Answer: C

Watch Video Solution

36. The general solution of the differential equation $y(x^2 y + e^x)dx - (e^x)dy = 0$, is

A. $x^3 y - 3e^x = Cy$

B. $x^3 y + 3e^x = 3Cy$

C. $y^3 x - 3e^y = Cx$

D. $y^3 x + 3e^y = Cx$

Answer: B

Watch Video Solution

37. If a curve $y = f(x)$ passes through the point $(1, -1)$ and satisfies the differential equaiton $.y(1 + xy)dx = xdy$, then $f\left(-\frac{1}{2}\right)$ is equal to :

A. $-\frac{2}{5}$

B. $-\frac{4}{5}$

C. $\frac{2}{5}$

D. $\frac{4}{5}$

Answer: D

Watch Video Solution

38. The solution of the differential equaiton $\frac{ydx + xdy}{ydx - xdy} = \frac{x^2 e^{xy}}{y^4}$ satisfying y(0) = 1, is

A. $x^3 = 3y^3\left(-1 + e^{-xy}\right)$

B. $x^3 = 3y^3\left(1 - e^{-xy}\right)$

C. $x^3 = 3y^3(-1 + e^{xy})$

D. $x^3 = 3y^3(1 - e^{xy})$

Answer: B

Watch Video Solution

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

A. $\log y = Cx$

B. $-\frac{1}{xy} + \log y = C$

C. $\frac{1}{xy} + \log y = C$

D. $-\frac{1}{xy} = C$

Answer: B::D

Watch Video Solution

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

A. $\tan^{-1}x+\cot^{-1}x=C$

B. $\sin^{-1}x+\sin^{-1}y=C$

C. $\sec^{-1}x+\operatorname{cosec}^{-1}x=C$

D. none of these

Answer: B

Watch Video Solution

41. The solution of differential equation xdy-ydx=0 represents

A. a rectangular hyperbola

B. a straight line passing through the origin

C. parabola whose vertex is at the origin

D. circle whose centre is at the origin

Answer: B

Watch Video Solution

42. The solution of differential equation $\cos x \sin y dx + \sin x \cos dy = 0$

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

B. $\cos x + \cos y = C$

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

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

Answer: D

Watch Video Solution

43. The solution of differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is

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

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

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

D. $\tan(xy) = C$

Answer: B

Watch Video Solution

44. The solution of the differential equation $\frac{dx}{x} + \frac{dy}{y} = 0$ is

A. $\frac{1}{x} + \frac{1}{y} = C$

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

C. $xy = C$

D. $x + y = C$

Answer: C

Watch Video Solution

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

A. a family of hyperbola

B. a family of circles whose centres are on y-axis

C. a family of circle of parabolas

D. a family of circles whose centres are on x-axis.

Answer: D

Watch Video Solution

46. If $y = y(x)$ and $\frac{2 + \sin x}{y + 1} \frac{dy}{dx} = -\cos x, y(0) = 1,$ then $y(\pi/2)$ equals

A. $\frac{1}{3}$

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

C. $-\frac{1}{3}$

D. 1

Answer: A

Watch Video Solution

47. The differential equation $\frac{dy}{dx} = \frac{\sqrt{1 - y^2}}{y}$ determinea a family of circles with :

A. variable radii and fixed centre at (0, 1)

B. variable radii and a fixed centre at $(0, -1)$

C. fixed radius 1 and variable centre along the x-axis

D. fixed radius 1 and variable centre along the y-axis

Answer: C

Watch Video Solution

48. Interval contained in the domain of definition of non-zero solution of the differential equation $(x-3)^2 y' + y = 0$ is:

A. $(-\pi/2, \pi/2)$

B. $(0, \pi)$

C. $(0, 2\pi)$

D. $(-\pi, \pi)$

Answer: A

Watch Video Solution

49. If $(2+\sin x)\frac{dy}{dx}+(y+1)\cos x=0$ and $y(0)=1$ then $y\left(\frac{\pi}{2}\right)$ is equal to

A. $\frac{1}{3}$

B. $\frac{4}{3}$

C. $\frac{1}{2}$

D. $-\frac{2}{3}$

Answer: A

Watch Video Solution

50. If $y=y(x)$ satisfies the differential equation

$8\sqrt{x}\left(\sqrt{9+\sqrt{x}}\right)dy=\left(\sqrt{4+\sqrt{9+\sqrt{x}}}\right)^{-1}$ dx

$x>0$ and $y(0)=\sqrt{7}$, then $y(256)$=

A. 3

B. 9

C. 16

D. 80

Answer: A

Watch Video Solution

51. The solution of $\cos(x+y)dy = dx$ is

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

B. $y = \cos^{-1}\left(\frac{y}{x}\right)$

C. $y = x\sec\left(\frac{y}{x}\right) + C$

D. none of these

Answer: A

Watch Video Solution

52. The solution of the differential equation $\frac{dy}{dx}+1=e^{x+y}$, is a. $(x+y)e^{x+y}=0$ b. $(x+C)e^{x+y}=0$ c. $(x-C)e^{x+y}=1$ d. $(x+C)e^{x+y}+1=0$

A. $(x+y)e^{x+y}=0$

B. $(x+C)e^{x+y}=0$

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

D. $(x+C)e^{x+y}+1=0$

Answer: D

Watch Video Solution

53. The equation of the curve passing through the origin and satisfying the differential equation $\left(\frac{dy}{dx}\right)^2=(x-y)^2$ is :

A. $e^{2x}(1-x+y)=1+x-y$

B. $e^{2x}(1+x-y)=1-x+y$

C. $e^{2x}(1 - x + y) + (1 + x - y) = 0$

D. $e^{2x}(1 + x + y) = 1 - x + y$

Answer: A

Watch Video Solution

54. The equation of the curve passing through the origin and satisfying the differential equation $\left(\frac{dy}{dx}\right)^2 = (x - y)^2$ is :

A. $e^{2x}(1 - x + y) = 1 + x - y$

B. $e^{2x}(1 + x - y) = 1 - x + y$

C. $e^{2x}(1 - x + y) + (1 + x - y)$

D. $e^{2x}(1 + x + y) = 1 - x + y$

Answer: A

Watch Video Solution

55. Solution of the differential equation $\left(\frac{x+y-1}{x+y-2}\right)\frac{dy}{dx}=\left(\frac{x+y+1}{x+y+1}\right)$, given that y = 1 when x = 1, is

A. $\log\left|\frac{(x-y)^2-2}{2}\right|=2(x+y)$

B. $\log\left|\frac{(x-y)^2+2}{2}\right|=2(x-y)$

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

D. none of these

Answer: D

Watch Video Solution

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

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

B. $x\frac{dy}{dx}-2y=x^3$

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

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

Answer: D

Watch Video Solution

57. From the dffential equation of all circles pass thrrough origin and whose centres lie on Y-axis.

A. a homogeneous differential equaion

B. a differential equation of order 1 and degree 2

C. a differential equation in variable separable form

D. a differential equation reducible to variable separable form

Answer: A

Watch Video Solution

58. By substituting y = vx, the solution of the differential equation $\frac{dy}{dx} - \frac{x^2 + y^2}{xy} = 0$, is

A. $x^2y^2 = \log x + C$

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

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

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

Answer: B

Watch Video Solution

59. Solution of the differential equation $x\frac{dy}{dx} = y + \sqrt{x^2 + y^2}$, is

A. $x + \sqrt{x^2 + y^2} = Cy^2$

B. $y + \sqrt{x^2 + y^2} = Cy^2$

C. $x + \sqrt{x^2 + y^2} = Cx^2$

D. $y+\sqrt{x^2+y^2}=Cx^2$

Answer: D

Watch Video Solution

60. Which of the following statements on ordinary differential equations is/are true ?

(i) The number of arbitrary constants is same as the degree of the differential equation.

(ii) A linear differential equation can contain products of the dependent variable and its derivatives.

(iii) A particular integral cannot contains arbitrary constants.

(iv) By putting $v=\frac{y}{x}$ any homogeneous first order differential equation transforms to variable separable form.

A. (i) and (iii) only

B. (ii) and (iii) only

C. (iii) only

D. (i) and (iv) only

Answer: C

Watch Video Solution

61. On putting $\frac{y}{x} = v$ the differential equation $\frac{dy}{dx} = \frac{2xy - y^2}{2xy - x^2}$ is transferred to

A. $x(2v - 1)dx = 3v(v - 1)dx$

B. $x(2v - 1)dv = 3v(1 - v)dx$

C. $x(1 - 2v)dv = (v^2 - 2v)dx$

D. $(1 - 2v)dv = (v^2 - 2v)dx$

Answer: B

Watch Video Solution

62. The differential equation $\frac{dy}{dx} + \frac{y^2}{x^2} = \frac{y}{x}$ has the solution

A. $x = y(\log x + C)$

B. $y = x(\log y + C)$

C. $x = (y + C)\log x$

D. $y = (x + C)\log y$

Answer: A

Watch Video Solution

63. Find the general solution of $y^2 dx + (x^2 - xy + y^2)dy = 0$

A. $\tan^{-1}. \frac{x}{y} + \log y + C = 0$

B. $2\tan^{-1}. \frac{x}{y} + \log x + C = 0$

C. $\log\left(y + \sqrt{x^2 + y^2}\right) + \log y + C = 0$

D. $\log y = \tan^{-1}. \frac{y}{x} + C$

Answer: D

Watch Video Solution

64. The solution of differential equation $\frac{dy}{dx} = \frac{y}{x} + \frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

A. $\phi\left(\frac{y}{x}\right) = kx$

B. $x\phi\left(\frac{y}{x}\right) = k$

C. $\phi\left(\frac{y}{x}\right) = ky$

D. $y\phi\left(\frac{y}{x}\right) = k$

Answer: A

Watch Video Solution

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

A. $\log\left(\frac{x}{y}\right) = Cy$

B. $\log\left(\frac{y}{x}\right) = Cx$

C. $x\log\left(\frac{y}{x}\right) = Cy$

D. $y\log\left(\frac{x}{y}\right) = Cx$

Answer: B

Watch Video Solution

66. The differential equation

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

reduces to homogeneous form by making the substitution

A. $x = X + 1, y = Y + 0$

B. $x = X + 1, y = Y + 1$

C. $x = X - 1, y = Y + 1$

D. $x = X + 0, y = Y + 1$

Answer: A

Watch Video Solution

67. The differential equation $\frac{dy}{dx} = \frac{x+y-1}{x+y+1}$

reduces to variable separable form by making the substitution

A. $x + y = v$

B. $x - y = v$

C. $y = vx$

D. $x = vy$

Answer: A

Watch Video Solution

68. The substituting $y = vx$ reduces the homogeneous differential equation $\frac{dy}{dx} = \frac{y}{x} + \tan. \frac{y}{x}$ to the form

A. $(\tan v)dv = xdx$

B. $(\tan v)dv = \frac{dx}{x}$

C. $(\cot v)dv = xdx$

D. $\cot v dv = \frac{dx}{x}$

Answer: D

Watch Video Solution

69. A solution curve of the differential equation $\left(x^2 + xy + 4x + 2y + 4\right)\frac{dy}{dx} - y^2 = 0, x > 0,$ passes through the point (1,3) Then, the solution curve

A. intersects $y = x + 2$ exactly at one point

B. intersects $y = x + 2$ exactly at two points

C. intersects $y = (x + 2)^2$

D. does not intersect $y = (x + 3)^2$

Answer: A::D

Watch Video Solution

70. The integrating factor of differential euation $\left(1-x^2\right)\frac{dy}{dx}-xy=1$ is

A. $-x$

B. $\frac{x}{1x^2}$

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

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

Answer: C

Watch Video Solution

71. The solution of $\frac{dy}{dx}+P(x)y=0$, is

A. $y=Ce^{\int pdx}$

B. $y=Ce^{-\int Pdx}$

C. $x = Ce^{-\int P dy}$

D. $x = Ce^{\int P dy}$

Answer: B

Watch Video Solution

72. The integrating factor of the differential equation $\frac{dy}{dx}(x(\log)_e x) + y = 2(\log)_e x$ is given by (a) $(b)x(c)$ (d) (b) $(e)(f)(g)e^{(h)x(i)}(j)(k)$ (l) (c) $(m)(n)(o)((p)\log)_q e(r)(s)x(t)$ (u) (d) *[Math Processing Error]* (ii)

A. $\log(\log x)$

B. e^x

C. $\log x$

D. x

Answer: C

Watch Video Solution

Watch Video Solution

73. Integrating factor of differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$ is (a) $(b)(c)\cos x(d)$ (e) (b) $(f)(g)\tan x(h)$ (i) (c) $(d)(e)\sec x(f)$ (g) (d) $(h)(i)\sin x(j)$ (k)

A. $\sin x$

B. $\sec x$

C. $\tan x$

D. $\cos x$

Answer: B

Watch Video Solution

74. about to only mathematics

A. $u = \log x$

B. $u = e^z$

C. $u = (\log z)^{-1}$

D. $u = (\log z)^2$

Answer: C

Watch Video Solution

75. The differential equation $x\frac{dy}{dx} - y = x^3$, has the general solution

A. $y = x^3 = 2Cx$

B. $2y - x^3 = 2Cx$

C. $2y + x^2 = 2Cx$

D. $y + x^2 = 2Cx$

Answer: B

Watch Video Solution

76. If integrating factor of $x(1-x^2)dy + (2x^2y - y - ax^3)dx = 0$ is $e^{\int p dx}$, then P is equal to

A. $\dfrac{2x^2 - ax^3}{x(1-x^2)}$

B. $2x^3 - 1)$

C. $\dfrac{2x^2 - 1}{ax^3}$

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

Answer: D

Watch Video Solution

77. The integrating factor of differential equation $\dfrac{dy}{dx} + y = \dfrac{1+y}{x}$ is

A. $\dfrac{x}{e^x}$

B. $\dfrac{e^x}{x}$

C. xe^x

D. e^x

Answer: B

Watch Video Solution

78. Integrating factor of the differential equation $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$, is

A. $-(x+1)$

B. $\log(x+1)$

C. e^{x+1}

D. $\frac{1}{x+1}$

Answer: D

Watch Video Solution

79. The differential equation

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

when transformed to linear form becomes

A. $\frac{dz}{dx} + \frac{z}{x^2} = x$

B. $\frac{dz}{dx} + zx = \frac{x^3}{2}$

C. $\frac{dz}{dx} + 2xz = x^3$

D. $\frac{dz}{dx} + \frac{z}{x} = x^2$

Answer: C

Watch Video Solution

80. The integrating factor of the differential equation

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

A. $\log(\log y)$

B. $\log y$

C. $\frac{1}{\log y}$

D. $\frac{1}{\log(\log y)}$

Answer: B

Watch Video Solution

81. Consider the differential equation $ydx - (x + y^2)dy = 0$. If for $y = 1$, x takes value 1, then value of x when y = 4, is

A. 64

B. 9

C. 16

D. 36

Answer: C

Watch Video Solution

82. The function $y = f(x)$ is the solution of the differential equation $\frac{dy}{dx} + \frac{xy}{x^2 - 1} = \frac{x^4 + 2x}{\sqrt{1 - x^2}}$ in $(-1, 1)$ satisfying $f(0) = 0$. Then

$\int_{\frac{\sqrt{3}}{2}}^{\frac{\sqrt{3}}{2}} f(x)dx$ is (a) $(b)(c)(d)\frac{\pi}{e}3(f)(g) - (h)\frac{(i)\sqrt{(j)3(k)}(l)}{m}2(n)(o)(p)$

(q) (b) $(r)(s)(t)\frac{\pi}{u}3(v)(w) - (x)\frac{(y)\sqrt{(z)3(aa)}(bb)}{cc}4(dd)(ee)(ff)$ (gg)

(c) $(d)(e)(f)\frac{\pi}{g}6(h)(i) - (j)\frac{(k)\sqrt{(l)3(m)}(n)}{o}4(p)(q)(r)$ (s) (d)

$(t)(u)(v)\frac{\pi}{w}6(x)(y) - (z)\frac{(aa)\sqrt{(bb)3(cc)}(dd)}{ee}2(ff)(gg)(hh)$ (ii)

A. $\frac{\pi}{3} - \frac{\sqrt{3}}{2}$

B. $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$

C. $\frac{\pi}{6} - \frac{\sqrt{3}}{4}$

D. $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$

Answer: B

Watch Video Solution

83. Let y(x) be the solution the differential equation $(x\log x)\frac{dy}{dx} + y = 2x\log x, (x \geq 1)$. Then y€ is equal to

A. 2

B. 2e

C. e

D. 0

Answer: A

Watch Video Solution

84. Let $y(x)$ be a solution of the differential equation $(1+e^x)y' + ye^x = 1$. If $y(0) = 2$, then watch of the following statements is (are) true?

A. $y(-4) = 0$

B. $y(-2) = 0$

C. $y(x)$ has critical point in the interval $(-1, 0)$

D. $y(x)$ has no critical point in the interval $(-1, 0)$

Answer: A::C

Watch Video Solution

85.

Let $f:(0.\infty)\to R$ be a differentiable function such that $f'(x)=2-$

Then

A. $\lim_{x\to 0^+} f'\left(\frac{1}{x}\right)=a$

B. $\lim_{x\to 0^+} xf\left(\frac{1}{x}\right)=2$

C. $\lim_{x\to 0^+} x^2 f'(x)=0$

D. $|f(x)|\leq 2$ for all $x\in(0,2)$

Answer: A

Watch Video Solution

86. Let the $f(x)$ be differentiabe function on the interval $(0,\infty)$ such that $f(1)=1$ and $\lim_{t\to x}\left(\frac{t^2 f(x)-x^2 f(t)}{t^2-x^2}\right)=\frac{1}{2}\forall x>0,$ then $f(x)$ is:

A. $\frac{1}{3x} + \frac{2}{3}x^2$

B. $-\frac{1}{3x} + \frac{4}{3}x^2$

C. $-\frac{1}{x} + \frac{2}{x^2}$

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

Answer: A

Watch Video Solution

87. If $f(x)$ is differentiable function in the interval $(0, \infty)$ such that f(1) = 1 and $\lim_{t \to x} \frac{t^2 f(x) - x^2(t)}{t - x} = 1$ for each $x > 0$, then $f\left(\frac{3}{2}\right)$ is equal tv

A. $\frac{13}{6}$

B. $\frac{23}{18}$

C. $\frac{25}{9}$

D. $\frac{31}{18}$

Answer: D

Watch Video Solution

88. Let f be a real-valued differentiable function on R (the set of all real numbers) such that $f(1) = 1.$ If the $y - \in tercept$ of the tangent at any point $P(x, y)$ on the curve $y = f(x)$ is equal to the cube of the abscissa of $P,$ then the value of $f(-3)$ is equal to_______

A. 3

B. 6

C. 9

D. 0

Answer: C

Watch Video Solution

89. Let $y'(x) + y(x)g'(x) = g(x)g'(x), y(0), x \in R,$ where $f'(x)$ denotes $\frac{dy(x)}{dx}$, and $g(x)$ is a given non-constant differentiable function on R with $g(0) = g(2) = 0$. Then the value of $y(2)$ is_____

A. 0

B. 1

C. -1

D. 2

Answer: A

Watch Video Solution

90. Let the population of rabbits surviving at a time t be governed by the differential equation $\frac{dp(t)}{dt} = \frac{1}{2}p(t) - 200$. If $p(0) = 100$, then p(t) equals (1) $400 - 300e^{t/2}$ (2) $300 - 200e^{-t/2}$ (3) $600 - 500e^{t/2}$ (4) $40 - 300e^{-t/2}$

A. $600 - 500e^{t/2}$

B. $400 - 300e^{-t/2}$

C. $400 - 300e^{t/2}$

D. $300 - 200e^{-t/2}$

Answer: C

Watch Video Solution

91. The solution of the differential equation $x\frac{dy}{dx} + y = x^3y^6$, is

A. $x^7 = 5y^5 + Cx^2y^5$

B. $2x^7 = 5y^5 + Cx^2y^5$

C. $5x^7 = 2y^5 + Cx^2y^5$

D. $2x^7 = 5y^5 + Cx^5y^2$

Answer: B

Watch Video Solution

92. The Bernouli's equation

$\frac{dy}{dx} - y\tan x = \frac{\sin x \cos^2 x}{y^2}$ can be transformed to

A. $\frac{dz}{dx - y\tan z = \sin z \cos^2 z}$

B. $\frac{dz}{dx + 3z\tan x = 3\sin \cos^2 x}$

C. $\frac{dz}{dx} - 3z\tan x = 3\sin x \cos^2 x$

D. $\frac{dz}{dx} - z\tan x = \sin x \cos^2 x$

Answer: C

Watch Video Solution

93. The differential equation $\frac{dy}{dx} + Py = Qy^n,\ n > 2$ can be reduced to linear form by substituting

a. $z = y^{n-1}$ b. $z = y^n$ c. $z = y^{n+1}$ d. $z = y^{1-n}$

A. $z = y^{n-1}$

B. $z = y^n$

C. $z = y^{n+1}$

D. $z = y^{1-n}$

Answer: D

Watch Video Solution

94. The solution of the differential equation $\frac{dy}{dx} + \frac{y}{2}\sec x = \frac{\tan x}{2y}$, where $0 \le x < \frac{\pi}{2}$, and $y(0) = 1$, is given by

A. $y^2 = 1 - \frac{x}{\sec x + \tan x}$

B. $y^2 = 1 + \frac{x}{\sec x + \tan x}$

C. $y = 1 + \frac{x}{\sec x + \tan x}$

D. $y = 1 - \frac{x}{\sec x + \tan x}$

Answer: A

Watch Video Solution

95. Find the orthogonal trajectories of the curves $y = cx^2$

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

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

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

D. $x^2 - 2y^2 = 2C$

Answer: A

Watch Video Solution

96. The differential equation representing all possible curves that cut each member of the family of circles $x^2 + y^2 - 2Cx = 0$ (C is a parameter) at right angle, is

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

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

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

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

Answer: B

Watch Video Solution

97. The orthogonal trajectories of the circle $x^2 + y^2 - ay = 0$, (where a is a parameter), is

A. $x^2 + y^2 - ay = 0$

B. $x^2 + y^2 = Cx$

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

D. $x^2 + y^2 = C(x + y)$

Answer: B

Watch Video Solution

Section I - Solved Mcqs

1. The degree of the differential equation $x = 1 + \left(\frac{dy}{dx}\right) + \frac{1}{2!}\left(\frac{dy}{dx}\right)^2 + \frac{1}{3!}\left(\frac{dy}{dx}\right)^3 + \ldots\ldots\ldots\ldots$ (A) 3 (B) 2 (C) 1 (D) not defined

A. 3

B. 1

C. not defined

D. none of these

Answer: B

Watch Video Solution

2. The order anda degree of the differential equation of all tangent lines to the parabola $x^2 = 4y$ is

A. 1,2

B. 2,2

C. 3,1

D. 4,1

Answer: A

Watch Video Solution

3. The differential equation of the rectangular hyperbola whose axes are the asymptotes of the hyperbola, is

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

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

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

D. $xdy + ydx = C$

Answer: B

Watch Video Solution

4. The differential equation of all ellipses with centres at the origin and the ends of one axis of symmetry at $(\pm 1, 0)$, is

A. $(x^2 - 1)y' - xy = 0$

B. $(x^2 + 1)y' + xy = 0$

C. $xy' + (x^2 + 1)y = 0$

D. $(x^2 - 1)y' + (x - 1)y' = 0$

Answer: A

Watch Video Solution

5. Let F be the family of ellipse whose centre is the origin and major axis is the y-axis. Then the differential equation of family F is

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

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

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

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

Answer: A

Watch Video Solution

6. Form the differential equation of the family of parabolas with focus at the origin and the axis of symmetry along the axis.

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

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

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

D. $y\left(\frac{dy}{dx}\right)^2 + 2xy\frac{dy}{dx} + y - 0$

Answer: B

Watch Video Solution

7. The differential equation of all conics whose centre lie at the origin is of order

A. 2

B. 3

C. 4

D. none of these

Answer: B

Watch Video Solution

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

A. 2

B. 3

C. 4

D. 1

Answer: A

Watch Video Solution

9. The order of the differential equation satisfying $\sqrt{1-x^4}+\sqrt{1-y^4}=a(x^2-y^2)$ is

A. 1

B. 2

C. 3

D. none of these

Answer: A

Watch Video Solution

10. Find the differential equation whose general solution is given by $y = (c_1 + c_2)\cos(x + c_3) - c_4 e^{x + c_5}$, where c_1, c_2, c_3, c_4, c_5 are arbitary constants.

A. 5

B. 4

C. 2

D. 3

Answer: D

Watch Video Solution

11. The degree and order of the differential equation of the family of all parabolas whose axis is x-axs are respectively

A. 2,1

B. 1,2

C. 3,2

D. none of these

Answer: B

Watch Video Solution

12. The differential equation of all parabolas whose axis are parallel to the y-axis is

A. $\frac{d^3y}{dx^3} = 1$

B. $\frac{d^3y}{dx^3}$

C. $\frac{d^3y}{dx^3} = 0$

D. none of these

Answer: C

Watch Video Solution

13. From the dffential equation of all circles pass thrrough origin and whose centres lie on Y-axis.

A. $\left(x^2 - y^2\right)\dfrac{dy}{dx} - 2xy = 0$

B. $\left(x^2 - y^2\right)\dfrac{dy}{dx} + 2xy = 0$

C. $\left(x^2 - y^2\right)\dfrac{dy}{dx} - xy = 0$

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

Answer: A

Watch Video Solution

14. The differential equation of the family of curves of $x^2 + y^2 - 2ay = 0$ where a is arbitary constant, is

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

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

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

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

Answer: C

Watch Video Solution

15. The equation of the curve in which the portion of the tangent included between the coordinate axes is bisected at the point of contact, is

A. a parabola

B. an ellipse

C. a circle

D. a hyperbola

Answer: D

Watch Video Solution

16. The solution of the differential equation

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

$(b)(c)y = 1n((d)x(e)) + c(f)$ (g) (b)

$(h)(i)(j)y^{(k)2(l)}(m) = (n)(o)((p)(q)1nx(r))^{(s)2(t)}(u) + c(v)$ (w) (c)

$(d)(e)y = \log x + xy(f)$ (g) (d) $(h)(i)xy = (j)x^{(k)y(l)}(m) + c(n)$ (o)

A. $y = \log_e(x) + C$

B. $y = (\log_e x)^2 + C$

C. $y = \pm\sqrt{(\log_e x)^2 + 2C}$

D. $xy = x^y + k$

Answer: C

Watch Video Solution

17. If the solution of the differential equation $\frac{dy}{dx} = \frac{ax + 4}{2y + f}$ represents a circle, then the value of a is:

A. 2

B. -2

C. 3

D. -4

Answer: B

Watch Video Solution

18. Integral curve satisfying $Y' = \frac{x^2 + y^2}{x^2 - y^2} y'(1) \neq 1$ has the slope at the point (1, 0) of the curve equal to:

A. $-\frac{5}{3}$

B. -1

C. 1

D. $\frac{5}{3}$

Answer: C

Watch Video Solution

19. Solution of equation $(xy^4 + y)dx - xdy = 0$ is

A. $4x^4y^3 + 3x^3 = Cy^3$

B. $3x^3y^4 + 4y^3 = Cx^3$

C. $3x^4y^3 + 4x^3 = Cy^3$

D. none of these

Answer: C

Watch Video Solution

20. The solution of the differential equation $(x + y)(dx - dy) = dx + dy$ is

A. $x - y = ke^{x - y}$

B. $x + y = ke^{x + y}$

C. $x + y = k(x - y)$

D. $x + y = ke^{x-y}$

Answer: D

Watch Video Solution

21. Solution of the differential equation

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

A. $x + y = a$

B. $\sqrt{x} - \sqrt{y} = a$

C. $x^2 + y^2 = a^2$

D. $\sqrt{x} + \sqrt{y} = \sqrt{a}$

Answer: D

Watch Video Solution

22. about to only mathematics

A. $x\sqrt{1-y^2}+y\sqrt{1-x^2}=a$

B. $y\sqrt{1-y^2}+x\sqrt{1-x^2}=a$

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

D. $y\sqrt{1-y^2}-x\sqrt{1-x^2}=a$

Answer: A

Watch Video Solution

23. A curve having the condition that the slope of the tangent at some point is two times the slope of the straight line joining the same point to the origin of coordinates is a/an

A. circle

B. ellipse

C. parabola

D. hyperbola

Answer: C

Watch Video Solution

24. The orthogonal trajectories of the family of curves $a^{n-1}y = x^n$ are given by

A. $x^n + n^2y$= constant

B. $ny^2 + x^2$= constant

C. $n^2x + y^n$= constant

D. $n^2x - y^n$= constant

Answer: B

Watch Video Solution

25. The orthogonal trajectories of the family of circles given by $x^2 + y^2 - 2ay = 0$, is

A. $x^2 + y^2 - 2kx = 0$

B. $x^2 + y^2 - 2ky = 0$

C. $x^2 + y^2 - 2k_1x - 2k_2y = 0$

D. none of these

Answer: A

Watch Video Solution

26. If $\phi(x)$ is a differentiable function, then the solution of the different equation $dy + \{y\phi'(x) - \phi(x)\phi'(x)\}dx = 0,$ is

A. $y = \{\phi(x) - 1\} + Ce^{-\phi(x)}$

B. $y\phi(x) = \{\phi(x)\}^2 + C$

C. $ye^{\phi(x)} = \phi(x)e^{\phi(x)} + C$

D. $y - \phi(x) = \phi(x)e^{-\phi(x)}$

Answer: A

Watch Video Solution

27. The solution of the differential equation $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$ is given by

A. $2\log|x| - \log|y| - \frac{1}{xy} = C$

B. $2\log|y| - \log|x| - \frac{1}{xy} = C$

C. $2\log|x| + \log|y| + \frac{1}{xy} = C$

D. $2\log|y| + \log|x| + \frac{1}{xy} = C$

Answer: A

Watch Video Solution

28. The equation of the family of curves which intersect the hyperbola xy=2 orthogonally is

A. $y = \frac{x^3}{6} + C$

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

C. $y = \frac{-x^3}{6} + C$

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

Answer: A

Watch Video Solution

29. If $x(t)$ is a solution of $\frac{(1+t)dy}{dx} - ty = 1$ and $y(0) = -1$ then $y(1)$ is (a) $(b)(c) - (d)\frac{1}{e}2(f)(g)(h)$ (i) (b) $(j)(k)e + (l)\frac{1}{m}2(n)(o)(p)$ (q) (c) $(d)(e)e - (f)\frac{1}{g}2(h)(i)(j)$ (k) (d) $(l)(m)(n)\frac{1}{o}2(p)(q)(r)$ (s)

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

B. $e + \frac{1}{2}$

C. $e - \frac{1}{2}$

D. $\frac{1}{2}$

Answer: A

Watch Video Solution

30. Solve the differential equation: $(1 + y^2) + \left(x - e^{\tan^{-1} y}\right)\frac{dy}{dx} = 0$

A. $xe^{2\tan^{-1} y} = e^{\tan^{-1} y + K}$

B. $(X - 2) = Ke^{\tan^{-1} y}$

C. $2xe^{\tan^{-1} y} = e^{2\tan^{-1} y} + K$

D. $xe^{\tan^{-1} y} = \tan^{-1} y + K$

Answer: C

Watch Video Solution

31. If $\sin x$ is an integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$, then write the value of P.

A. $\log \sin x$

B. $\cot x$

C. $\sin x$

D. $\log \cos x$

Answer: B

Watch Video Solution

32. A function $y = f(x)$ has a second order derivative $f''(x) = 6(x - 1)$. If its graph passes through the point $(2, 1)$ and at that point the tangent to the graph is $y = 3x - 5$ then the function is

A. $(x + 1)^2$

B. $(x - 1)^3$

C. $(x+1)^3$

D. $(x-1)^2$

Answer: B

Watch Video Solution

33. IF x dy $= y(dx + ydy), y(1) = 1$ and y $(x) > 0$ then $y(-3)$ is equal to :

A. 3

B. 2

C. 1

D. 0

Answer: A

Watch Video Solution

34. Tangent is drawn at any point P of a curve which passes through (1, 1) cutting x-axis and y-axis at A and B respectively. If AP:BP = 3:1, then ,

A. the differential equation of the curve is $3x\frac{dy}{dx} + y = 0$ and the curve passes through $(1/8, 2)$

B. the differential eqaution of the curve is $3x\frac{dy}{dx} - y = 0$ and the curve pass through $(1/8, -2)$

C. the curve is passing through $(-1/8, -2)$

D. the normal at (1,1) is $x + 3y = 4$

Answer: A

Watch Video Solution

35. Let f be a non-negative function defined on the interval $[0, 1]$. If $\int_0^x \sqrt{1 - (f'(t))^2} dt = \int_0^x f(t) dt, 0 \le x \le 1, and\ f(0) = 0$, then

A. $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$

B. $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) > \frac{1}{3}$

C. $f\left(\frac{1}{2}\right) < \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$

D. $f\left(\frac{1}{2}\right) > \frac{1}{2}$ and $f\left(\frac{1}{3}\right) < \frac{1}{3}$

Answer: C

Watch Video Solution

36. Solution of the following equation

cos x dy =y(sinx-y)dx,0 $< x < \frac{\pi}{2}$ is

A. $y \tan x = \sec x + C$

B. $\tan x = (\sec x + C)y$

C. $\sec x = (\tan x + C)y$

D. $y \sec x = \tan x + C$

Answer: C

Watch Video Solution

37. Let $f:[1,\infty]$ be a differentiable function such that $f(1)=2$. If $\int_1^x f(t)dt = 3xf(x) - x^3$ for all $x \geq 1$, then the value of $f(2)$ is

A. 3

B. 4

C. 5

D. 6

Answer: D

Watch Video Solution

38. If $\frac{dy}{dx} = y + 3$ and $y(0) = 2$, then y(ln 2) is equal to

A. 7

B. 5

C. 13

D. -2

Answer: A

Watch Video Solution

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

A. $3 - \frac{1}{y} + \frac{e^{1/y}}{e}$

B. $1 + \frac{1}{y} - \frac{e^{\frac{1}{y}}}{e}$

C. $1 - \frac{1}{y} + \frac{e^{1/y}}{e}$

D. $4 - \frac{2}{y} - \frac{e^{1/y}}{e}$

Answer: B

Watch Video Solution

40. The curve that passes through the point $(2, 3)$ and has the property that the segment of any tangent to it lying between the coordinate axes is bisected by the point of contact, is given by

A. $y = \frac{6}{x}$

B. $x^2 + y^2 = 13$

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

D. $2y - 3x = 0$

Answer: A

Watch Video Solution

41. Let I be the purchase value of an equipment and V(t) be the value after it has been used for t years. The value V(t) depreciates at a rate given by differential equation $\frac{dV(t)}{dt}$=-k(T-t) , where $k > 0$ is a constant and T is the total life in years of the equipment. Then the scrap value V(T) of the equipment is : (1) $T^2 - \frac{1}{k}$ (2) $I - \frac{kT^2}{2}$ (3) $I - \frac{k(T-t)^2}{2}$ (4) e^{-kT}

A. $T^2 - \frac{I}{k}$

B. $I - \frac{kT^2}{2}$

C. $I - \frac{(T-t)^2}{2}$

D. e^{-kT}

Answer: D

Watch Video Solution

42. The general solution of the differential equation $\frac{dy}{dx} + \frac{2}{x}y = x^2$, is

A. $y = cx^2 + \frac{x^3}{5}$

B. $y = cx^{-2} + \frac{x^3}{5}$

C. $y = cx^3 - \frac{x^3}{4}$

D. $y = cx^{-3}\frac{x^2}{4}$

Answer: B

Watch Video Solution

43. If y(x) satisfies the differential equation $y' - y\tan x = 2x$ and $y(0) = 0$, then

A. $y\left(\frac{\pi}{4}\right) = \frac{\pi^2}{8\sqrt{2}}, y'\left(\frac{\pi}{3}\right) = \frac{4\pi}{3} + \frac{2\pi^2}{3\sqrt{3}}$

B. $y\left(\frac{\pi}{4}\right) = \frac{\pi^2}{4\sqrt{2}}, y'\left(\frac{\pi}{4}\right) = \frac{\pi^2}{18}$

C. $y\left(\frac{\pi}{3}\right) = \frac{\pi^2}{9}, y'\left(\frac{\pi}{3}\right) = \frac{4\pi}{3} + \frac{\pi^2}{3\sqrt{3}}$

D. $y\left(\frac{\pi}{3}\right) = \frac{\pi^2}{4\sqrt{2}}, y'\left(\frac{\pi}{3}\right) = \frac{\pi^2}{18}$

Answer: A

Watch Video Solution

44. A curve passes through the point $\left(1, \frac{\pi}{6}\right)$. Let the slope of the curve at each point (x, y) be $\frac{y}{x} + \sec\left(\frac{y}{x}\right), x > 0$. Then the equation of the curve is

A. $\sin\left(\frac{y}{x}\right) = \log x + \frac{1}{2}$

B. $\operatorname{cosec}\left(\frac{y}{x}\right) = \log x + 2$

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

D. $\cos\left(\frac{2y}{x}\right) = \log x + \frac{1}{2}$

Answer: A

Watch Video Solution

45. Consider the family of all circles whose centers lie on the straight line $y = x$. If the family of circles is represented by the differential equation $Py'' + Qy' + 1 = 0$, where P, Q are functions of x, y and y' (here $y' = \frac{dy}{dx}, y'' = \frac{d^2y}{dx^2}$, then which of the following statements is (are) true?

A. $P = y + x$

B. $P = y - x$

C. $P + Q = 1 - x + y + y' + (y')^2$

D. $P - Q = x + y - y' - (y')^2$

Answer: B::C

Watch Video Solution

46. The sum of the squares of the perpendicular drawn from the points (0,1) and $(0, -1)$ to any tangent to a curve is 2. The equation of the curve, is

A. $2y = C(x+2)$

B. $y = C(x+1)$

C. $y = C(x+2)$

D. $y = C(x+2)$

Answer: B

Watch Video Solution

47. The solution of the equation $(2+x)dy - ydx = 0$ represents a curve passing through a fixed point P, then the area of equilateral triangle with P as one vertex and $x+y=0$ as its one side, is

A. $2\sqrt{3}$

B. $\sqrt{3}$

C. $\dfrac{2}{\sqrt{3}}$

D. $\dfrac{4}{\sqrt{3}}$

Answer: C

Watch Video Solution

48. If $\dfrac{dx}{dy} = (e^y - x)$, where y(0)=0, then y is expressed explicitly as

A. $\dfrac{1}{2}\ln(1+x^2)$

B. $\ln(1+x^2)$

C. $\ln\left(x - \sqrt{1+x^2}\right)$

D. $\ln\left(x+\sqrt{1-x^{2}}\right)$

Answer: C

Watch Video Solution

Section II - Assertion Reason Type

1. Let y(x) be a solution of $xdy+ydx+y^{2}(xdy-ydx)=0$ satisfying y(1)=1.

Statement -1 : The range of y(x) has exactly two points.

Statement-2 : The constant of integration is zero.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

Watch Video Solution

2. Let a solution y=y(x) of the differential equation $x\sqrt{x^2-1}dy - y\sqrt{y^2-1}dx = 0$ satisfy $y(2) = \frac{2}{\sqrt{3}}$

Statement I $y(x) = \sec\left(\sec^{-1}x - \frac{\pi}{6}\right)$

Statement II y(x) is given by $\frac{1}{y} = \frac{2\sqrt{3}}{x} - \sqrt{1-\frac{1}{x^2}}$

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

Watch Video Solution

3. Let a solution $y = y(x)$ of the differential equation $\frac{dy}{dx}\cos x + y\sin x = 1$ satisfy y(0)=1

Statement-1: $y(x) = \sin\left(\frac{\pi}{4} + x\right)$

Statement-2: The integrating factor of the given differential equation is sec x.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

Watch Video Solution

4. Let y_1 and y_2 be the solutions of the differential equation $\frac{dy}{dx}+Py=Q$, where P and Q are functional of x.

Statement-1 : $\frac{y_2-y_1}{y_1}=Ce^{-\int\frac{Q}{y1}dx}$

Statement-2 : If $y_2=y_1z$, then $z=1+Ce^{\int\frac{-Q}{y1}dx}$, where C is an arbitrary constant.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

Watch Video Solution

5. Let y_1 and y_2 be the two solutions of the differential equation $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x,

Statement-1: The linear combination $ay_1 + by_2$ will be a solution of the differential equation, if $a + b = 1$.

Statement-2 : The general solution of the differential equation is $y = y_1 + C(y_1 - y_2)$.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

Watch Video Solution

Exercise

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

A. $x^3 - y^3 = C$

B. $x^3 + y^3 = C$

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

D. $x^2 - y^2 = C$

Answer: A

Watch Video Solution

2. The general solution of the differential equaiton $(1 + y^2)dx + (1 + x^2)dy = 0$, is

A. $x - y = C(1 - xy)$

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

C. $x + y = C(1 - xy)$

D. $x + y = C(1 + xy)$

Answer: C

Watch Video Solution

3. The order of the differential equation of all circle of radius r, having centre on y-axis and passing through the origin, is

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

4. Write the order of the differential equation whose solution is $y = a\cos x + b\sin x + ce^{-x}$.

A. 3

B. 2

C. 1

D. none of these

Answer: A

Watch Video Solution

5. The solution of the equation $\frac{dy}{dx} = \frac{x+y}{x-y}$, is

A. $C\left(x^2+y^2\right)^{1/2} + e^{\tan^{-1}\left(\frac{y}{x}\right)} = 0$

B. $C\left(x^2+y^2\right)^{1/2} + e^{\tan^{-1}\left(\frac{y}{x}\right)}$

C. $C\left(x^2-y^2\right)^{1/2} + e^{\tan^{-1}\left(\frac{y}{x}\right)}$

D. none of these

Answer: B

Watch Video Solution

6. Writhe the order of the differential equation of the family of circles of radius $r \cdot$

A. 2

B. 3

C. 4

D. none of these

Answer: A

Watch Video Solution

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

A. 1

B. 2

C. 3

D. none of these

Answer: A

Watch Video Solution

8. For the differential equation whose solution is $(x-h)^2+(y-k)^2=a^2$ (a is a constant), its (a) order is 2 (b) order is 3 (c) degree is 2 (d) degree is 3

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

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

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

D. none of these

Answer: B

Watch Video Solution

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

A. a set of circles having centre on the y-axis

B. a set of circle centre on the x-axis

C. a set of ellipses

D. none of these

Answer: B

Watch Video Solution

10. The differential equation of displacement of all "Simple harmonic motions" of given period $\frac{2\pi}{n}$, is

A. $\frac{d^2x}{dt^2} + nx = 0$

B. $\frac{d^2x}{dt^2} + n^2x = 0$

C. $\frac{d^2x}{dt^2} - n^2x = 0$

D. $\frac{d^2x}{dt^2} + \frac{1}{n^2}x = 0$

Answer: B

Watch Video Solution

11. The differential equation of family of curves whose tangent form an angle of $\frac{\pi}{4}$ with the hyperbola $xy = C^2$ is

A. $\frac{dy}{dx} = \frac{x^2 + c^2}{x^2 - C^2}$

B. $\frac{dy}{dx} = \frac{x^2 - C^2}{x^2 + C^2}$

C. $\frac{dy}{dx} = -\frac{C^2}{x^2}$

D. none of these

Answer: B

Watch Video Solution

12. The differential equation of all parabolas whose axis are parallel to the y-axis is

A. $\frac{d^3y}{dx^3} = 0$

B. $\frac{d^2x}{dy^2} = C$

C. $\frac{d^3y}{dx^3} + \frac{d^2x}{dy^2} = 0$

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

Answer: A

Watch Video Solution

13. Find the curve for which the length of normal is equal to the radius vector.

A. $y^2 \pm x^2 = k^2$

B. $y \pm x = k$

C. $y^2 = kx$

D. none of these

Answer: A

Watch Video Solution

14. Differential equation of all parabolas having their axes of symmetry coincident with the axis of X is :

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

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

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

D. none of these

Answer: A

Watch Video Solution

15. The equation of a curve passing through $\left(2, \frac{7}{2}\right)$ and having gradient $1 - \frac{1}{x^2}$ at (x, y) is (a) $(b)(c)y = (d)x^{(e)2(f)}(g) + x + 1(h)$ (i) (b) $(j)(k)xy = (l)x^{(m)2(n)}(o) + x + 1(p)$ (q) (c) $(d)(e)xy = x + 1(f)$ (g)

(d) None of these

A. $y = x^2 + x + 1$

B. $xy = x^2 + x + 1$

C. $xy = x + 1$

D. none of these

Answer: B

Watch Video Solution

16. The equation of the curves through the point (1, 0) and whose slope is $\frac{y-1}{x^2+x}$ is (a) $(b)(c)((d)(e)y - 1(f))((g)(h)x + 1(i)) + 2x = 0(j)$ (k)

(l) $(m)(n)2x((o)(p)y - 1(q)) + x + 1 = 0(r)$ (s) (t)

$(u)(v)x((w)(x)y-1(y))((z)(aa)x+1(bb))+2=0(cc)$ (dd) (ee)None of these

A. $(y-1)(x+1)+2x=0$

B. $2x(y-1)+x+1=0$

C. $x(y-1)(x+1)+2=0$

D. none of these

Answer: A

Watch Video Solution

17. about to only mathematics

A. $x^2=y+5$

B. $y^2=x-5$

C. $y^2=x+5$

D. $x^2=y-5$

Answer: C

Watch Video Solution

18. A particle moves in a straight line with a velocity given by $\frac{dx}{dt} = x + 1$ (x is thhe distance travelled). If the time taken by a particle to traverse a distance of 99m is λthen the value of must be...

A. $\log_{10} e$

B. $\log_e 10$

C. $2\log_{10} e$

D. $\frac{1}{2}\log_{10} e.$

Answer: B

Watch Video Solution

19. If $\frac{dy}{dx} = e^{-2y}$ and $y = 0 \text{when} x = 5$ then fiind the value of x when y=3

A. e^5

B. $e^6 + 1$

C. $\frac{e^6 + 9}{2}$

D. $\log_e 6$

Answer: C

Watch Video Solution

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

A. $(1 + x^2)y = x^3$

B. $2(1 + x^2)y = 3x^3$

C. $3(1 + x^2)y = 4x^3$

D. none of these

Answer: C

Watch Video Solution

21. The slope of the tangent at (x, y) to a curve passing through $\left(1, \frac{\pi}{4}\right)$ is given by $\frac{y}{x} - \cos^2\left(\frac{y}{x}\right)$, then the equation of the curve is (a) $(b)(c)y = (d)(e)\tan^{(f)(g)-1(h)}(i)\left((j)(k)\log\left((l)(m)(n)\frac{e}{o}x(p)(q)(r)\right)(s)\right.$ (u) (v) *[Math Processing Error]* (pp) (qq) *[Math Processing Error]* (kkk) (d) none of these

A. $y = \tan^{-1}\left\{\log\left(\frac{e}{x}\right)\right\}$

B. $y = x\tan^{-1}\left\{\log\left(\frac{x}{e}\right)\right\}$

C. $y = x\tan^{-1}\left\{\log\left(\frac{e}{x}\right)\right\}$

D. none of these

Answer: C

Watch Video Solution

22. If $\phi(x) = \phi'(x)$ and $\phi(1) = 2$, then $\phi(3)$ equals

A. e^2

B. $2e^2$

C. $3e^2$

D. $2e^3$

Answer: B

Watch Video Solution

23. about to only mathematics

A. 0

B. 10

C. 8

D. 2

Answer: B

Watch Video Solution

24. The curve for which the slope of the tangent at any point is equal to the ration of the abcissa to the ordinate of the point is

A. an ellipse

B. a parabola

C. a rectangular hyperbola

D. a circle

Answer: C

Watch Video Solution

25. The curve in the first quadrant for which the normal at any point (x, y) and the line joining the origin to that point form an isosceles triangle with the x-axis as base is (a) an ellipse (b) a rectangular hyperbola (c) a circle (d) None of these

A. an ellipse

B. a rectangular hyperbola

C. a circle

D. none of these

Answer: B

Watch Video Solution

26. The function $f(\theta) = \frac{d}{dth\eta}\int_0^\theta \frac{dx}{1-\cos\theta\cos x}$ satisfies the differential equation (a) $(b)(c)(d)\frac{(e)df((f)\theta(g))}{h}((i)dth\eta)(j)(k) + 2f((l)\theta(m)) = 0(n)$ (o) (p) $(q)(r)(s)\frac{(t)df}{u}((v)dth\eta)(w)(x) - 2f((y)\theta(z))\cot\theta = 0(aa)$ (bb) (cc)

$$(dd)(ee)(ff)\frac{(gg)df}{hh}((ii)dth\eta)(jj)(kk)+2f((ll)\theta(mm))=0(nn)$$

(oo) (d)

$$(pp)(qq)(rr)\frac{(ss)df}{tt}((uu)dth\eta)(vv)(ww)-2((xx)\theta(yy))=0(zz)$$

(aaa)

A. A. $\frac{df}{d\theta}+2f(\theta)\cot\theta=0$

B. B. $\frac{df}{d\theta}-2f(\theta)\cot\theta=0$

C. C. $\frac{df}{d\theta}+2f(\theta)=0$

D. D. $\frac{df}{d\theta}-2f(\theta)=0$

Answer: A

Watch Video Solution

27. The differential equation of all ellipses centred at the origin is

A. $y_2+xy_1^2-yy_1=0$

B. $xyy_2+xy_1^2-yy_1=0$

C. $yy_2 + xy_1^2 - xy_1 = 0$

D. none of these

Answer: B

Watch Video Solution

28. The differential equation of the curve for which the initial ordinate of any tangent is equal to the corresponding subnormal (a) is linear (b) is homogeneous of second degree (c) has separable variables (d) is of second order

A. homogeeous and linear

B. homogeneous only

C. in variable separable form

D. linear only

Answer: A

Watch Video Solution

Watch Video Solution

29. The equation of the curve whose subnormal is constant is

A. $y = ax + b$

B. $y^2 = 2ax + b$

C. $ay^2 - x^2 = a$

D. none of these

Answer: B

Watch Video Solution

30. The degree of the differential equation

$y_3^{2/3} + 2 + 3y_2 + y_1 = 0$, is

A. 1

B. 2

C. 3

D. none of these

Answer: B

Watch Video Solution

31. The degree of the differential equation satisfying $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$ is (a) 1 (b) 2 (c) 3 (d) none of these

A. 1

B. 2

C. 3

D. none of these

Answer: A

Watch Video Solution

32. The order of the differential equation whose general solution is given by $y = (C_1 + C_2)\cos(x + C_3) - C_4 e^{x + 4_5}$, where C_1, C_2, C_3, C_4, C_5, are arbitrary constants, is (a) 5 (b) 4 (c) 3 (d) 2

A. 5

B. 4

C. 3

D. 2

Answer: C

Watch Video Solution

33. The equation of the curve satisfying the differential equation $y^2(x^2 + 1) = 2xy$ passing through the point (0,1) and having slope of tangnet at $x = 0$ as 3, is (Here $y = \frac{dy}{dx}$ and $y_2 = \frac{d^2y}{dx^2}$)

A. $y = x^2 + 3x + 2$

B. $y^2 = x^2 + 3x + 1$

C. $y = x^3 + 3x + 1$

D. none of these

Answer: C

Watch Video Solution

34. A differential equation associated to the primitive $y = a + be^{5x} + ce^{-7x}$ is (where y_n is nth derivative w.r.t. x) (a) $(b)(c)(d)y_e3(f)(g) + 2(h)y_i2(j)(k) - (l)y_m1(n)(o) = 0(p)$ (q) (r) *[Math Processing Error]* (hh) (ii) *[Math Processing Error]* (yy) (d) none of these (zz) *[Math Processing Error]* (ddd) y_n reprersents $(eee)(fff)nth(ggg)$ (hhh) order derivative.

A. $y_3 + 2y_2 - y_1 = 0$

B. $4y_3 + 5y_2 - 20y_1 = 0$

C. $y_3 + 2y_2 - 35y_1 = 0$

D. none of these

Answer: C

Watch Video Solution

35. Write the order of the differential equation associated with the primitive $y = C_1 + C_2 e^x + C_3 e^{-2x + C_4}, \ where \, C_1, C_2, C - 3, \ C_4$ are arbitrary constants.

A. 3

B. 4

C. 2

D. none of these

Answer: A

Watch Video Solution

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

A. $y_1\left(y^2 - x^2\right) + 2xy + a^2$

B. $y_1 y^2 + xy + a^2 x^2 = 0$

C. $y_1\left(y^2 - x^2 + a^2\right) + 2xy = 0$

D. none of these

Answer: C

Watch Video Solution

37. The solution of the differential equation $y_1 y_3 = 3y_2^2$, is

A. $x = A_1 y^2 + A_2 y + A_3$

B. $x = A_1 y + A_2$

C. $x = A_1 y^2 + A_2 y$

D. none of these

Answer: A

Watch Video Solution

38. The degree and order of the differential equation of all parabolas whose axis is x-axis are

A. 2

B. 1,2

C. 3,2

D. none of these

Answer: B

Watch Video Solution

39. The differential equation of all parabolas whose axis are parallel to the y-axis is

A. $y_2 = 2y_1 + x$

B. $y_3 = 2y_1$

C. $y_2^3 = y_1$

D. none of these

Answer: D

Watch Video Solution

40. The equation of the curve which is such that the portion of the axis of x cut off between the origin and tangent at any point is proportional to the ordinate of that point is (a) $(b)(c)x = y(a - b\log x)(d)$ (e) (f) $(g)(h)\log x = b(i)y^{(j)2(k)}(l) + a(m)$ (n) (o) $(p)(q)(r)x^{(s)2(t)}(u) = y(a - b\log y)(v)$ (w) (d) None of these

A. $x = y(a - b\log x)$

B. $\log x = by^2 + a$

C. $x = y(a - b\log y)$

D. none of these

Answer: C

Watch Video Solution

41. The solution of $\frac{dy}{dx} = \frac{ax+h}{by+k}$ represent a parabola when

A. $a=0, b=0$

B. $a=1, b=2$

C. $a=0, b \neq 0$

D. $a=2, b=1$

Answer: C

Watch Video Solution

42. The solution of the differential equation $y\frac{dy}{dx} = x - 1$ satisfying y(1) = 1, is

A. $y^2 = x^2 - 2x + 2$

B. $y^2 = 2x^2 - x - 1$

C. $y = x^2 - 2x + 2$

D. none of these

Answer: A

Watch Video Solution

43. The differential equation of the family of circles of fixed radius r and having their centres on y-axis is:

A. $y^2(1 + y_1^2) = r^2 y_1^2$

B. $y^2 = r^2 y_1 + y_1^2$

C. $x^2(1 + y_1^2) = r^2 y_1^2$

D. $x^2 = r^2 y_1 + y_1^2$

Answer: C

Watch Video Solution

44. The solution of $\frac{dv}{dt} + \frac{k}{m}v = -g$ is

A. $v = ce^{-\frac{k}{m}t} - \frac{mg}{k}$

B. $v = c - \frac{mg}{k}e^{-\frac{k}{m}l}$

C. $ve^{-\frac{k}{m}t} = c - \frac{mg}{k}$

D. $ve^{\frac{k}{m}t} = c - \frac{mg}{k}$

Answer: A

Watch Video Solution

45. $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$

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

B. $\frac{x}{y} - e^3 = 0$

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

D. none of these

Answer: A

Watch Video Solution

46. The curve for which the length of the normal is equal to the length of the radius vector is/are (a) circles (b) rectangular hyperbola (c) ellipses (d) straight lines

A. only circles

B. only rectangular hyperbola

C. either circles or rectangular hyperbolas

D. none of these

Answer: C

Watch Video Solution

47. The family of curves represented by $\frac{dy}{dx} = \frac{x^2 + x + 1}{y^2 + y + 1}$ and $\frac{dy}{dx} + \frac{y^2 + y + 1}{x^2 + x + 1} = 0$

A. touch each other

B. are orthogonal

C. are one and the differential

D. none of these

Answer: B

Watch Video Solution

48. The form of the differential equation of the central conics, is

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

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

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

D. none of these

Answer: C

Watch Video Solution

49. The solution of the differential eqaution

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

A. $\log\left(\frac{x}{y}\right)=\frac{1}{x}+\frac{1}{y}+C$

B. $\log\left(\frac{y}{x}\right)=\frac{1}{x}+\frac{1}{y}+C$

C. $\log(xy)=\frac{1}{x}+\frac{1}{y}+C$

D. $\log(xy)+\frac{1}{x}+\frac{1}{y}=C$

Answer: A

Watch Video Solution

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

A. $y(1-x^2) = \tan^{-1} x + C$

B. $y(1+x^2) = \tan^{-1} x + C$

C. $y(1+x^2)^2 = \tan^{-1} x + C$

D. $y(1-x^2)^2 = \tan^{-1} x + C$

Answer: B

Watch Video Solution

51. The equation of the curve through the point (1,0) which satisfies the differential equatoin $(1+y^2)dx - xydy = 0$, is

A. $x^2 + y^2 = 4$

B. $x^2 - y^2 \equiv$

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

D. none of these

Answer: B

Watch Video Solution

52. The differential equation of family of curves $x^2 + y^2 - 2ax = 0$, is

A. $x^2 - y^2 - 2xyy' = 0$

B. $y^2 - x^2 = 2xyy'$

C. $x^2 + y^2 + 2y'' = 0$

D. none of these

Answer: A

Watch Video Solution

53. The solution of the differential equation

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

A. $\frac{x}{\sin y} + \log x - C$

B. $\frac{y}{\sin x} + \log x = C$

C. $\log y + x = C$

D. $\log x + y = C$

Answer: A

Watch Video Solution

54. The solution of $\frac{dy}{dx} + 2y \tan x = \sin x,$ is

A. $y \sec^3 x = \sec^2 x + C$

B. $y \sec^2 x = \sec x + C$

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

D. none of these

Answer: B

Watch Video Solution

55. Solve the each of the following differential equation: $\frac{dy}{dx} + \frac{y}{x} = x^2$

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

B. $y = x^{-1} + Cx^{-3}$

C. $y = \frac{x^3}{4} + Cx^{-1}$

D. $xy = x^2 + C$

Answer: C

Watch Video Solution

56. Solve the differential equation: $(1 + y^2) + \left(x - e^{\tan^{-1} y}\right)\frac{dy}{dx} = 0$

A. $2xe^{\tan^{-1}y} = e^{2\tan^{-1}y} + k$

B. $2xe^{\tan^{-1}y} = e^{\tan^{-1}y} + k$

C. $xe^{\tan^{-1}y} = e^{\tan^{-1}y} + k$

D. $xe^{\tan^{-1}y}$

Answer: A

Watch Video Solution

57. Solution of $x\frac{dy}{dx} + y = xe^x$, is

A. $xy = e^x(x+1) + C$

B. $xy = e^x(x-1) + C$

C. $xy = e^x(1-x) + C$

D. $xy = e^y(y-1) + C$

Answer: B

Watch Video Solution

58. The tangent at any point (x, y) of a curve makes an angle $\tan^{-1}(2x + 3y)$ with x-axis. Find the equation of the curve if it passes through (1,2).

A. $6x + 9y + 2 = 26e^{3(x-1)}$

B. $6x - 9y + 2 = 26e^{3(x-1)}$

C. $6x + 9y - 2 = 26e^{3(x-1)}$

D. $6x - 9y - 2 = 26e^{3(x-1)}$

Answer: A

Watch Video Solution

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

A. $\frac{x}{e^x}$

B. $\frac{e^x}{x}$

C. xe^x

D. e^x

Answer: B

Watch Video Solution

60. The degree of the differential equation corresponding to the family of curves $y = a(x+a)^2$, where a is an arbitrary constant is

A. 1

B. 2

C. 3

D. none of these

Answer: C

Watch Video Solution

61. The degree of the differential equation of all curves having normal of constant length 'c' is

A. 1

B. 3

C. 4

D. none of these

Answer: D

Watch Video Solution

62. The differential equation of the family of ellipses having major and minor axes respectively along the x and y-axes and minor axis is equal to half of the major axis, is

A. $xy' - 4y = 0$

B. $4xy' + y = 0$

C. $4yy' + x = 0$

D. $yy' + 4x = 0$

Answer: C

Watch Video Solution

63. Find the differential equation satisfying the relation $\sqrt{1+x^2} + \sqrt{1+y^2} = \lambda x\sqrt{1+y^2} - y\sqrt{1+x^2}$.

A. 1

B. 2

C. 3

D. none of these

Answer: A

Watch Video Solution

64. The differential eqaution of the family of curve $y^2 = 4a(x+a)$, is

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

B. $2y = \frac{dy}{dx} + 4a$

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

D. $y^2\frac{dy}{dx} + 4y = 0$

Answer: C

Watch Video Solution

65. Find the equation of the curve in which the subnormal varies as the square of the ordinate.

A. $y = Ce^{2\lambda x}$

B. $y = Ce^{\lambda x}$

C. $y^2/2 + \lambda x = C$

D. $y^2 + \lambda x^2 = C$

Answer: B

Watch Video Solution

66. The solution of differential equation xdy-ydx=0 represents

A. a parabola whose vertax is at the origin

B. a circle whose centre is at the origin

C. a rectangular hyperbola

D. straight lines passing through the origin

Answer: D

Watch Video Solution

67. The equation of the curve whose subnormal is twice the abscissa, is

A. a circle

B. a parabola

C. an ellipse

D. a hyperbola

Answer: D

Watch Video Solution

68. The solution of the differential equation

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

A. $y=x\cot(C-x)$

B. $\cos^{-1}. \frac{y}{x}=(-x+C)$

C. $y=x\tan(C-x)$

D. $\frac{y^2}{x^2}=x\tan(C-x)$

Answer: C

Watch Video Solution

69. A curve passes through the point (0,1) and the gradient at (x,y) on it is $y(xy-1)$. The equation of the curve is

A. $y(x-1)=1$

B. $y(x+1)=1$

C. $x(y+1)=1$

D. $x(y-1)=1$

Answer: B

Watch Video Solution

70. The equation of the curves through the point (1, 0) and whose slope is $\frac{y-1}{x^2+x}$ is (a) $(b)(c)((d)(e)y-1(f))((g)(h)x+1(i))+2x=0(j)$ (k) (l) $(m)(n)2x((o)(p)y-1(q))+x+1=0(r)$ (s) (t)

$(u)(v)x((w)(x)y-1(y))((z)(aa)x+1(bb))+2=0(cc)$ (dd) (ee)None of these

A. $xy+x+y-1=0$

B. $xy-x-y-1=0$

C. $(y-1)(x+1)=2x$

D. $y(x+1)-x+1=0$

Answer: A

Watch Video Solution

71. The differential equation for which $\sin^{-1}x+\sin^{-1}y=c$ is given by

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

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

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

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

Answer: A

Watch Video Solution

72. The solution of the differential equation $\frac{dx}{x}+\frac{dy}{y}=0$ is

A. $\log x=\log y$

B. $\frac{1}{x}+\frac{1}{y}=c$

C. $x+y=c$

D. $xy=c$

Answer: D

Watch Video Solution

73. The order of the differential equation of family of circles touching two given circles externally is

A. 1

B. 2

C. 3

D. none of these

Answer: A

Watch Video Solution

74. The function f(x) satisfying the equation

$f^2(x) + 4f'(x).\ f(x) + [f'(x)]^2 = 0.$

A. $Ce^{\left(2+\sqrt{3}\right)x}$

B. $Ce^{\left(4\pm\sqrt{5}\right)x}$

C. $Ce^{\left(-2\pm\sqrt{3}\right)x}$

D. $C\log\left(1+\sqrt{3}\right)x$

Answer: C

Watch Video Solution

Chapter Test

1. $(x^2+y^2)dy = xydx. \, If y(x_o) = e, y(1) = 1,$ then the value of x_o is equal to :

A. $\sqrt{2}e$

B. $\sqrt{3}e$

C. $\sqrt{5}e$

D. $e/\sqrt{2}$

Answer: B

Watch Video Solution

2. The differential equation of the family of curves $y^2 = 4xa(x+1)$, is

A. a.$y^2 = 4\frac{dy}{dx}\left(x + \frac{dy}{dx}\right)$

B. b. $y^2\left(\frac{dy}{dx}\right)^2 + 2xy\frac{dy}{dx} - y^2 = 0$

C. c.`y = (2x+2)(dy)/(dx)

D. d.$y^2 = \frac{dy}{d} + 4y = 0$

Answer: B

Watch Video Solution

3. $y = ae^{mx} + be^{-mx}$ satisfies which of the following differential equation?

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

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

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

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

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

5. The differential equation of the family of curves $y = e^{2x}(a\cos x + b\sin x)$ where, a and b are arbitrary constants, is given by

A. $y_2 - 4y_1 + 5y = 0$

B. $2y_2 - y_1 + 5y = 0$

C. $y_2 + 4y_1 - 5y = 0$

D. $y_2 - 2y_1 + 5y = 0$

Answer: A

Watch Video Solution

6. The differential equation obtained on eliminating A and B from $y = A\cos\omega t + b\sin\omega t$, is (a)$y^{''} + y' = 0$ (b.) $y^{''} + \omega^2 y = 0$ (c.) $y^{''} = \omega^2 y$ (d.) $y^{''} + y = 0$

A. $y^n + y' = 0$

B. $y^n + w^2 y = 0$

C. $y^n = w^2 y$

D. $y^n + y = 0$

Answer: B

Watch Video Solution

7. The solution of $\frac{dy}{dx} = \left(\frac{y}{x}\right)^{1/3}$, is

A. $x^{2/3} + y^{2/3} = C$

B. $x^{1/3} + y^{1/3} = C$

C. $y^{2/3} - x^{2/3} = C$

D. $y^{1/3} - x^{1/3} = C$

Answer: C

Watch Video Solution

8. The slope of the tangent at (x, y) to a curve passing through a point $(2, 1)$ is $\frac{x^2 + y^2}{2xy}$, then the equation of the curve is (a) $(b)(c)2\left((d)(e)(f)x^{(g)2(h)}(i) - (j)y^{(k)2(l)}(m)(n)\right) = 3x(o)$ (p) (b) [Math Processing Error] (ee) (c) $(d)(e)x\left((f)(g)(h)x^{(i)2(j)}(k) - (l)y^{(m)2(n)}(o)(p)\right) = 6(q)$ (r) (d)

$(s)(t)x\left((u)(v)(w)x^{(x)2(y)}(z)+(aa)y^{(bb)2(cc)}(dd)(ee)\right)=10(ff)$

(gg)

A. $2\left(x^2-y^2\right)=3x$

B. $2\left(x^2-y^2\right)=6y$

C. $x\left(x^2-y^2\right)=6$

D. $x\left(x^2+y^2\right)=10$

Answer: A

Watch Video Solution

9. Solve $Y-X\frac{dy}{dx}=a\left(y^2+\frac{dy}{dx}\right)$

A. $(x+a)(x+ay)=Cy$

B. $(x+a)(1-ay)=Cy$

C. $(x+a)(1-ay)=C$

D. none of these

Answer: B

Watch Video Solution

10. The solution of the differential equation $(x+2y^2)\frac{dy}{dx}=y$, is

A. $x=y^2+C$

B. $y=x^2+C$

C. $x=y(y^2+C)$

D. $y=x(x^2+C)$

Answer: C

Watch Video Solution

11. The general solution of the differential equation $\frac{dy}{dx}+\sin\left(\frac{x+y}{2}\right)=\sin\left(\frac{x-y}{2}\right)$ is

A. $\log\tan\left(\frac{y}{2}\right)=C-2\sin x$

B. $\log\tan\left(\frac{y}{4}\right)=C-2\sin\left(\frac{x}{2}\right)$

C. $\log\tan\left(\frac{y}{2}+\frac{\pi}{4}\right)=C-2\sin x$

D. $\log\tan\left(\frac{y}{2}+\frac{\pi}{4}\right)=C-2\frac{\sin(x)}{2}$

Answer: B

Watch Video Solution

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

A. $-\exp(x)$

B. $-\exp(-x)$

C. -1

D. $2\exp(x)-1$

Answer: D

Watch Video Solution

13. The number of solution of $y' = \frac{x+1}{x-1}, y(1) = 2$, is

A. none

B. one

C. two

D. infinite

Answer: A

Watch Video Solution

14. What is the solution of $y' = 1 + x + y^2 + xy^2, y(0) = 0$?

A. $y^2 = \exp\left(x + \frac{x^2}{2}\right) - 1$

B. $y^2 = 1 + C\exp\left(x + \frac{x^2}{2}\right)$

C. $y = \tan(C + x + x^2)$

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

Answer: D

Watch Video Solution

15. Solution of the differential equation $x\frac{dy}{dx} = y + \sqrt{x^2 + y^2}$, is

A. $x + \sqrt{x^2 + y^2} = Cx^2$

B. $y - \sqrt{x^2 + y^2} = Cx$

C. $x - \sqrt{x^2 + y^2} = Cx$

D. $y + \sqrt{x^2 + y^2} = Cx^2$

Answer: D

Watch Video Solution

16. Integral curve satisfying $Y' = \frac{x^2 + y^2}{x^2 - y^2} y'(1) \neq 1$ has the slope at the point (1, 0) of the curve equal to:

A. $-5/3$

B. -1

C. 1

D. $5/3$

Answer: C

Watch Video Solution

17. The differential equation which represents the family of plane curves $y = \exp(cx)$, is

A. $y' = cy$

B. $xy' - \log y = 0$

C. $x \log y = yy'$

D. $y \log y = xy'$

Answer: D

Watch Video Solution

18. A continuously differentiable function $y = f(x), x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ satisfying $Y' = 1 + y^2, y(0) = 0$ is :

A. $\tan x$

B. $x(x - \pi)$

C. $(x - \pi)(1 - e^x)$

D. not possible

Answer: A

Watch Video Solution

19. The solution of the differential equation $\frac{d^2y}{dx^2} = e^{-2x}$, is

A. $\frac{1}{4}e^{-2x}$

B. $\frac{1}{4}e^{-2x} + cx + d$

C. $\frac{1}{4}e^{-2x} + cx^2 + d$

D. $\frac{1}{4}e^{-2x} + c + d$

Answer: B

Watch Video Solution

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

A. 2,2

B. 1,2

C. 2,3

D. 2,1

Answer: A

Watch Video Solution

21. The solution of differential equation $\frac{dy}{dx}=\frac{y}{x}+\frac{\phi\left(\frac{y}{x}\right)}{\phi'\left(\frac{y}{x}\right)}$ is

A. $\phi(y/x)=kx$

B. $x\phi(y/x)=k$

C. $\phi(y/x)=ky$

D. $y\phi(y/x)=k$

Answer: A

Watch Video Solution

22. The solution of the equation $\log\left(\frac{dy}{dx}\right) = ax + by$ is (a) $(b)(c)(d)\frac{(e)(f)e^{(g)\,(h)\,by\,(i)}\,(j)}{k}b(l)(m) = (n)\frac{(o)(p)e^{(q)\,(r)\,ax\,(s)}\,(t)}{u}a(v)(w$

(y) (b) [Math Processing Error] (xx) (c)

$(d)(e)(f)\frac{(g)(h)e^{(i)\,(j)\,-by\,(k)}\,(l)}{m}a(n)(o) = (p)\frac{(q)(r)e^{(s)\,(t)\,ax\,(u)}\,(v)}{w}b(x)($

(aa) (d) None of these

A. $\frac{e^{by}}{b} = \frac{e^{ax}}{a} + C$

B. $\frac{e^{-by}}{-b} = \frac{e^{ax}}{a} + C$

C. $\frac{e^{-by}}{a} = \frac{e^{ax}}{b} + C$

D. none of these

Answer: B

Watch Video Solution

23. $\tan^{-1}x + \tan^{-1}y = C$ is 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. $(1+x^2)dy + (1+y^2)dx = 0$

D. $\frac{dy}{dx} = \frac{1-y^2}{1-x^2}$

Answer: C

Watch Video Solution

24. $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$

A. $\frac{x}{y} = x^3 + c$

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

C. $xy = e^{x^3} + C$

D. $xy = e^x + C$

Answer: A

Watch Video Solution

25. The solution of the differential equaton

$$\frac{dy}{dx} = \frac{x \log x^2 + x}{\sin y + y \cos y}, \text{ is}$$

A. $y \sin y = x^2 \log x + C$

B. $y \sin y = x^2 + C$

C. $y \sin y = x^2 + \log x + C$

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

Answer: A

Watch Video Solution

26. The solution of the differential equaiton

$$\cos x dy = y(\sin x - y)dx, 0 < x < \frac{\pi}{2}$$

A. $y \tan x = \sec x + C$, is

B. $\tan x = (\sec x + C)y$

C. $\sec x = (\tan x + C)y$

D. $y \sec x = \tan x + C$

Answer: C

Watch Video Solution

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

A. $e^x (\sin y + \cos y) = C$

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

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

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

Answer: D

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

30. The solution of the differential equation $\frac{dy}{dx} = \frac{x+y}{x}$ satisfying the condition $y(1) = 1$ is (1) $y = \ln x + x$ (2) $y = x\ln x + x^2$ (3) $y = xe(x-1)$ (4) $y = x\ln x + x$

A. $y = xe^{x-1}$

B. $y = x\ln x + x$

C. $y = \ln x + x$

D. $y = x\ln x + x^2$

Answer: B

Watch Video Solution