EXERCISE-I

Order and degree of differential equations

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

(A) 4, 2 (B) 1, 2

(C) 2, 2 (D) $2, \frac{1}{2}$

2. The order and the degree of the differential equation $\left(\frac{d^2s}{dt^2}\right)^2 + 3\left(\frac{ds}{dt}\right)^3 + 4 = 0$ are

(A) 2,2 (B) 2,3

(C) 3,2 (D) None of these

3. The order and the degree of differential equation

$$\frac{d^4y}{dx^4} - 4\frac{d^3y}{dx^3} + 8\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 4y = 0$$

are respectively

(A) 4, 1 (B) 1, 4

(C) 1, 1 (D) None of these

4. The order of the differential equation $y\left(\frac{dy}{dx}\right) = x \Big/ \frac{dy}{dx} + \left(\frac{dy}{dx}\right)^3$ is

(A) 1 (B) 2

(C) 3 (D) 4

5. The order of the differential equation whose solution is

$x^2 + y^2 + 2gx + 2fy + c = 0$, is

(A) 1 (B) 2

(C) 3 (D) 4

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

(A) 1 (B) 2

(C) 3 (D) 4

7. The order of the differential equation whose solution is

$y = a\cos x + b\sin x + ce^{-x}$ is

(A) 3 (B) 2

(C) 1 (D) None of these

8. The differential equation of all circles of radius *a* is of order

(A) 2 (B) 3

(C) 4 (D) None of these

9. The differential equation of all circles in the first quadrant which touch the coordinate axes is of order

(A) 1 (B) 2

(C) 3 (D) None of these

10. Order and degree of 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

11. The order and degree of the differential equation $\rho = \frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{3/2}}{d^2y/dx^2}$ are respectively

(A) 2, 2 (B) 2, 3

(C) 2, 1 (D) None of these

12. Order of the differential equation of the family of all concentric circles centered at (h, k) is

(A) 1 (B) 2

(C) 3 (D) 4

13. The degree of differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 + 6y = 0$ is

(A) 1 (B) 3

(C) 2 (D) 5

14. The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3+\left(\frac{dy}{dx}\right)^4-xy=0$ are respectively

(A) 2 and 4 (B) 3 and 2

(C) 4 and 5 (D) 2 and 3

15. $\frac{d^3y}{dx^3}+2\left[1+\frac{d^2y}{dx^2}\right]=1$ has degree and order as

(A) 1, 3 (B) 2, 3

(C) 3, 2 (D) 3, 1

16. The degree and order of the differential equation of the family of all parabolas whose axis is *x*–axis, are respectively

(A) 2, 1 (B) 1, 2

(C) 3, 2 (D) 2, 3

17. The degree of the differential equation $\left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/4}=\left(\frac{d^2y}{dx^2}\right)^{1/3}$ is

(A) $\frac{1}{3}$ (B) 4

(C) 9 (D) $\frac{3}{4}$

18. The order and degree of the differential equation $x\left(\frac{dy}{dx}\right)^3+2\left(\frac{d^2y}{dx^2}\right)^2+3y+x=0$ are respectively

(A) 3, 2 (B) 2, 1

(C) 2, 2 (D) 2, 3

19. The degree of the differential equation $\frac{d^2y}{dx^2}-\sqrt{\frac{dy}{dx}-3}=x$ is

(A) 2 (B) 1

(C) 1/2 (D) 3

20. The order of differential equations of all parabolas having directrix parallel to *x*-axis is

(A) 3 (B) 1

(C) 4 (D) 2

Formation of differential equations

21. The differential equation of the family of curves $y=a\cos(x+b)$ is

(A) $\frac{d^2y}{dx^2}-y=0$ (B) $\frac{d^2y}{dx^2}+y=0$

(C) $\frac{d^2y}{dx^2}+2y=0$ (D) None of these

22. The differential equation for all the straight lines which are at a unit distance from the origin is

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

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

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

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

23. If $y=ce^{\sin^{-1}x}$, then corresponding to this the differential equation is

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

(C) $\frac{dy}{dx}=\frac{x}{\sqrt{1-x^2}}$ (D) None of these

24. The differential equation of the family of curves represented by the equation $x^2y=a$, is

(A) $\frac{dy}{dx}+\frac{2y}{x}=0$ (B) $\frac{dy}{dx}+\frac{2x}{y}=0$

(C) $\frac{dy}{dx}-\frac{2y}{x}=0$ (D) $\frac{dy}{dx}-\frac{2x}{y}=0$

25. The differential equation corresponding to primitive $y = e^{cx}$ is

or

The elimination of the arbitrary constant m from the equation $y = e^{mx}$ gives the differential equation

(A) $\frac{dy}{dx} = \left(\frac{y}{x}\right)\log x$ (B) $\frac{dy}{dx} = \left(\frac{x}{y}\right)\log y$

(C) $\frac{dy}{dx} = \left(\frac{y}{x}\right)\log y$ (D) $\frac{dy}{dx} = \left(\frac{x}{y}\right)\log x$

26. The differential equation whose solution is $y = c_1 \cos ax + c_2 \sin ax$ is

(Where c_1, c_2 are arbitrary constants)

(A) $\frac{d^2y}{dx^2} + y^2 = 0$ (B) $\frac{d^2y}{dx^2} + a^2y = 0$

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

27. The differential equation for the line $y = mx + c$ is (where c is arbitrary constant)

(A) $\frac{dy}{dx} = m$ (B) $\frac{dy}{dx} + m = 0$

(C) $\frac{dy}{dx} = 0$ (D) None of these

28. The differential equation of all straight lines passing through the point $(1, -1)$ is

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

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

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

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

29. The differential equation of the family of curves $y^2 = 4a(x+a)$, where a is an arbitrary constant, is

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

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

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

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

30. The differential equation of the family of curves $v = \frac{A}{r} + B$, where A and B are arbitrary constants, is

(A) $\frac{d^2v}{dr^2} + \frac{1}{r}\frac{dv}{dr} = 0$ (B) $\frac{d^2v}{dr^2} - \frac{2}{r}\frac{dv}{dr} = 0$

(C) $\frac{d^2v}{dr^2} + \frac{2}{r}\frac{dv}{dr} = 0$ (D) None of these

31. Family of curves $y = e^x(A\cos x + B\sin x)$, represents the differential equation

(A) $\frac{d^2y}{dx^2} = 2\frac{dy}{dx} - y$ (B) $\frac{d^2y}{dx^2} = 2\frac{dy}{dx} - 2y$

(C) $\frac{d^2y}{dx^2} = \frac{dy}{dx} - 2y$ (D) $\frac{d^2y}{dx^2} = 2\frac{dy}{dx} + y$

32. The elimination of the arbitrary constants A, B and C from $y = A + Bx + Ce^{-x}$ leads to the differential equation

(A) $y''' - y' = 0$

(B) $y''' - y'' + y' = 0$

(C) $y''' + y'' = 0$

(D) $y'' + y'' - y' = 0$

33. The differential equation obtained on eliminating A and B from the equation $y = A\cos\omega t + B\sin\omega t$ is

(A) $y'' = -\omega^2 y$ (B) $y'' + y = 0$

(C) $y'' + y' = 0$ (D) $y'' - \omega^2 y = 0$

34. If $y = ax^{n+1} + bx^{-n}$, then $x^2\dfrac{d^2y}{dx^2}$ equals to

(A) $n(n-1)y$ (B) $n(n+1)y$

(C) ny (D) n^2y

35. The differential equation of all straight lines passing through the origin is

(A) $y = \sqrt{x\dfrac{dy}{dx}}$ (B) $\dfrac{dy}{dx} = y + x$

(C) $\dfrac{dy}{dx} = \dfrac{y}{x}$ (D) None of these

Variable separable type differential equations

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

(A) $y = \tan(x^2 + x + c)$

(B) $y = \tan(2x^2 + x + c)$

(C) $y = \tan(x^2 - x + c)$

(D) $y = \tan\left(\dfrac{x^2}{2} + x + c\right)$

37. The solution of $\dfrac{dy}{dx} = e^x(\sin x + \cos x)$ is

(A) $y = e^x(\sin x - \cos x) + c$

(B) $y = e^x(\cos x - \sin x) + c$

(C) $y = e^x \sin x + c$

(D) $y = e^x \cos x + c$

38. The general solution of $x^2\dfrac{dy}{dx} = 2$ is

(A) $y = c + \dfrac{2}{x}$ (B) $y = c - \dfrac{2}{x}$

(C) $y = 2cx$ (D) $y = c - \dfrac{3}{x^2}$

39. The solution of $\dfrac{dy}{dx} = x\log x$ is

(A) $y = x^2\log x - \dfrac{x^2}{2} + c$

(B) $y = \dfrac{x^2}{2}\log x - x^2 + c$

(C) $y = \dfrac{1}{2}x^2 + \dfrac{1}{2}x^2\log x + c$

(D) None of these

40. The solution of the differential equation $\dfrac{dy}{dx} = 1 + x + y + xy$ is

(A) $\log(1+y) = x + \dfrac{x^2}{2} + c$

(B) $(1+y)^2 = x + \dfrac{x^2}{2} + c$

(C) $\log(1+y) = \log(1+x) + c$

(D) None of these

41. The solution of the differential equation $(x^2 - yx^2)\dfrac{dy}{dx} + y^2 + xy^2 = 0$ is

(A) $\log\left(\dfrac{x}{y}\right) = \dfrac{1}{x} + \dfrac{1}{y} + c$

(B) $\log\left(\dfrac{y}{x}\right) = \dfrac{1}{x} + \dfrac{1}{y} + c$

(C) $\log(xy) = \dfrac{1}{x} + \dfrac{1}{y} + c$

(D) $\log(xy) + \dfrac{1}{x} + \dfrac{1}{y} = c$

42. The solution of the differential equation $x\sec y\dfrac{dy}{dx} = 1$ is

(A) $x\sec y\tan y = c$

(B) $cx = \sec y + \tan y$

(C) $cy = \sec x\tan x$

(D) $cy = \sec x + \tan x$

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

(A) $y=1+cxy$ (B) $y=\log\{cxy\}$

(C) $y+1=cxy$ (D) $y=c+xy$

44. If $\frac{dy}{dx}+\frac{1}{\sqrt{1-x^2}}=0$, then

(A) $y+\sin^{-1}x=c$

(B) $y^2+2\sin^{-1}x+c=0$

(C) $x+\sin^{-1}y=0$

(D) $x^2+2\sin^{-1}y=1$

45. If $\frac{dy}{dx}=\frac{xy+y}{xy+x}$, then the solution of the differential equation is

(A) $y=xe^x+c$ (B) $y=e^x+c$

(C) $y=Axe^{x-y}$ (D) $y=x+A$

46. The solution of the differential equation $\frac{dy}{dx}+\frac{1+\cos 2y}{1-\cos 2x}=0$

(A) $\tan y+\cot x=c$ (B) $\tan y\cot x=c$

(C) $\tan y-\cot x=c$ (D) None of these

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

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

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

(C) $2\tan^{-1}y+\log(1+x^2)+c=0$

(D) None of these

48. Solution of the equation $(e^x+1)ydy=(y+1)e^xdx$ is

(A) $c(y+1)(e^x+1)+e^y=0$

(B) $c(y+1)(e^x-1)+e^y=0$

(C) $c(y+1)(e^x-1)-e^y=0$

(D) $c(y+1)(e^x+1)=e^y$

49. Solution of the equation $(1-x^2)dy+xydx=xy^2dx$ is

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

(B) $(y-1)^2(1-x)^2=c^2y^2$

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

(D) None of these

50. The solution of the equation $\sqrt{a+x}\frac{dy}{dx}+x=0$ is

(A) $3y+2\sqrt{a+x}.(x-2a)=3c$

(B) $3y+2\sqrt{x+a}.(x+2a)=3c$

(C) $3y+\sqrt{x+a}.(x+2a)=3c$

(D) None of these

51. Solution of the equation $\cos x\cos y\frac{dy}{dx}=-\sin x\sin y$ is

(A) $\sin y+\cos x=c$ (B) $\sin y-\cos x=c$

(C) $\sin y.\cos x=c$ (D) $\sin y=c\cos x$

52. The solution of the differential equation $x(e^{2y}-1)dy+(x^2-1)e^ydx=0$ is

(A) $e^y+e^{-y}=\log x-\frac{x^2}{2}+c$

(B) $e^y-e^{-y}=\log x-\frac{x^2}{2}+c$

(C) $e^y+e^{-y}=\log x+\frac{x^2}{2}+c$

(D) None of these

53. The solution of $\frac{dy}{dx}=\sin(x+y)+\cos(x+y)$ is

(A) $\log\left[1+\tan\left(\frac{x+y}{2}\right)\right]+c=0$

(B) $\log\left[1+\tan\left(\frac{x+y}{2}\right)\right]=x+c$

(C) $\log\left[1-\tan\left(\frac{x+y}{2}\right)\right]=x+c$

(D) None of these

54. The solution of the differential equation $\frac{dy}{dx}=\frac{x-y+3}{2(x-y)+5}$ is

(A) $2(x-y)+\log(x-y)=x+c$

(B) $2(x-y)-\log(x-y+2)=x+c$

(C) $2(x-y)+\log(x-y+2)=x+c$

(D) None of these

55. The solution of the differential equation $(1-x^2)(1-y)dx=xy(1+y)dy$ is

(A) $\log[x(1-y)^2]=\frac{x^2}{2}+\frac{y^2}{2}-2y+c$

(B) $\log[x(1-y)^2]=\frac{x^2}{2}-\frac{y^2}{2}+2y+c$

(C) $\log[x(1+y)^2]=\frac{x^2}{2}+\frac{y^2}{2}+2y+c$

(D) $\log[x(1-y)^2]=\frac{x^2}{2}-\frac{y^2}{2}-2y+c$

56. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right)=x+y$ is

(A) $e^x+e^y=c$ (B) $e^x+e^{-y}=c$

(C) $e^{-x}+e^y=c$ (D) $e^{-x}+e^{-y}=c$

57. The general solution of the differential equation $\frac{dy}{dx}=\cot x\cot y$ is

(A) $\cos x=c\cos ecy$ (B) $\sin x=c\sec y$

(C) $\sin x=c\cos y$ (D) $\cos x=c\sin y$

58. The solution of the equation $\frac{dy}{dx}=\frac{y^2-y-2}{x^2+2x-3}$ is

(A) $\frac{1}{3}\log\left|\frac{y-2}{y+1}\right|=\frac{1}{4}\log\left|\frac{x+3}{x-1}\right|+c$

(B) $\frac{1}{3}\log\left|\frac{y+1}{y-2}\right|=\frac{1}{4}\log\left|\frac{x-1}{x+3}\right|+c$

(C) $4\log\left|\frac{y-2}{y+1}\right|=3\log\left|\frac{x-1}{x+3}\right|+c$

(D) None of these

59. The general solution of the differential equation $ydx+(1+x^2)\tan^{-1}xdy=0,$ is

(A) $y\tan^{-1}x=c$ (B) $x\tan^{-1}y=c$

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

60. 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) $x^2-y^2=c$

61. If $\frac{dy}{dx}=e^{-2y}$ and $y=0$ when $x=5,$ the value of x for $y=3$ is

(A) e^5 (B) e^6+1

(C) $\frac{e^6+9}{2}$ (D) $\log_e 6$

62. The solution of differential equation $dy-\sin x\sin ydx=0$ is

(A) $e^{\cos x}\tan\frac{y}{2}=c$ (B) $e^{\cos x}\tan y=c$

(C) $\cos x\tan y=c$ (D) $\cos x\sin y=c$

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

(A) $(e^y+1)\cos x=K$

(B) $(e^y+1)\text{cosec}\,x=K$

(C) $(e^y+1)\sin x=K$

(D) None of these

64. Solution of differential equation $\frac{dy}{dx}=\sin x+2x$, is

(A) $y=x^2-\cos x+c$

(B) $y=\cos x+x^2+c$

(C) $y=\cos x+2$

(D) $y=\cos x+2+c$

65. Solution of differential equation $\frac{dy}{dx} = 2xy$ is

(A) $y = ce^{x^2}$ (B) $y^2 = 2x^2 + c$

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

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

(A) $(x+y)^2 = \frac{a^2}{2}x + c$

(B) $(x+y)^2 = a^2x + c$

(C) $(x+y)^2 = 2a^2x + c$

(D) None of these

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

(A) $xy = c$ (B) $x + y = c$

(C) $\log x \log y = c$ (D) $x^2 + y^2 = c$

68. The solution of differential equation $y - x\frac{dy}{dx} = a\left(y^2 + \frac{dy}{dx}\right)$ is

(A) $(x+a)(x+ay) = cy$

(B) $(x+a)(1-ay) = cy$

(C) $(x+a)(1-ay) = c$

(D) None of these

69. The solution of $\log\left(\frac{dy}{dx}\right) = ax + by$ is

(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

70. 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) $y^{1/3} - x^{1/3} = c$

Homogeneous differential equations

71. The solution of the differential equation $(x^2 + y^2)dx = 2xydy$ is

(A) $x = c(x^2 + y^2)$

(B) $x = c(x^2 - y^2)$

(C) $x + c(x^2 - y^2) = 0$

(D) None of these

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

(A) $c(x^2 + y^2)^{1/2} + e^{\tan^{-1}(y/x)} = 0$

(B) $c(x^2 + y^2)^{1/2} = e^{\tan^{-1}(y/x)}$

(C) $c(x^2 - y^2) = e^{\tan^{-1}(y/x)}$

(D) None of these

73. The solution of the differential equation $(3xy + y^2)dx + (x^2 + xy)dy = 0$ is

(A) $x^2(2xy + y^2) = c^2$

(B) $x^2(2xy - y^2) = c^2$

(C) $x^2(y^2 - 2xy) = c^2$

(D) None of these

74. The solution of the differential equation $x\,dy - y\,dx = (\sqrt{x^2 + y^2})dx$ is

(A) $y - \sqrt{x^2 + y^2} = cx^2$

(B) $y + \sqrt{x^2 + y^2} = cx^2$

(C) $y + \sqrt{x^2 + y^2} + cx^2 = 0$

(D) None of these

75. The general solution of the differential equation $(x+y)dx + xdy = 0$ is

(A) $x^2 + y^2 = c$ (B) $2x^2 - y^2 = c$

(C) $x^2 + 2xy = c$ (D) $y^2 + 2xy = c$

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

(A) $\log(y-x) = c + \frac{y-x}{x}$

(B) $\log(y-x) = c + \frac{x}{y-x}$

(C) $y - x = c + \log\frac{x}{y-x}$

(D) $y - x = c + \frac{x}{y-x}$

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

(A) $ay^2 = e^{x^2/y^2}$ (B) $ay = e^{x/y}$

(C) $y = e^{x^2} + e^{y^2} + c$ (D) $y = e^{x^2} + y^2 + c$

78. The solution of the equation $\frac{dy}{dx} = \frac{x}{2y-x}$ is

(A) $(x-y)(x+2y)^2 = c$

(B) $y = x + c$

(C) $y = (2y - x) + c$

(D) $y = \frac{x}{2y-x} + c$

79. The solution of the equation $\frac{dy}{dx} = \frac{y}{x}\left(\log\frac{y}{x} + 1\right)$ is

(A) $\log\left(\frac{y}{x}\right) = cx$ (B) $\frac{y}{x} = \log y + c$

(C) $y = \log y + 1$ (D) $y = xy + c$

80. Solution of differential equation $\frac{dy}{dx} = \frac{y-x}{y+x}$ is

(A) $\log_e(x^2+y^2) + 2\tan^{-1}\frac{y}{x} + c = 0$

(B) $\frac{y^2}{2} + xy = xy - \frac{x^2}{2} + c$

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

(D) $y = x - 2\log_e y + c$

81. If $y' = \frac{x-y}{x+y}$, then its solution is

(A) $y^2 + 2xy - x^2 = c$

(B) $y^2 + 2xy + x^2 = c$

(C) $y^2 - 2xy - x^2 = c$

(D) $y^2 - 2xy + x^2 = c$

Exact differential equations

82. The solution of $(x - y^3)dx + 3xy^2dy = 0$ is

(A) $\log x + \frac{x}{y}$ (B) $\log x + \frac{y^3}{x} = k$

(C) $\log x - \frac{x}{y^3} = k$ (D) $\log xy - y^3 = k$

83. The solution of $ye^{-x/y}dx - (xe^{-x/y} + y^3)dy = 0$ is

(A) $\frac{y^2}{2} + e^{-x/y} = k$ (B) $\frac{x^2}{2} + e^{-x/y} = k$

(C) $\frac{x^2}{2} + e^{x/y} = k$ (D) $\frac{y^2}{2} + e^{x/y} = k$

84. The solution of the differential equation $x\,dy + y\,dx - \sqrt{1-x^2y^2}\,dx = 0$ is

(A) $\sin^{-1} xy = c - x$

(B) $xy = \sin(x + c)$

(C) $\log(1 - x^2y^2) = x + c$

(D) $y = x\sin x + c$

85. Solution of the differential equation, $y\,dx - x\,dy + xy^2dx = 0$ can be

(A) $2x + x^2y = \lambda y$ (B) $2y + y^2x = \lambda y$

(C) $2y - y^2x = \lambda y$ (D) None of these

86. If c is any arbitrary constant, then the general solution of the differential equation $ydx - xdy = xy\,dx$ is given by

(A) $y = cx\,e^{-x}$ (B) $x = cye^{-x}$

(C) $y + e^x = cx$ (D) $ye^x = cx$

Linear differential equations

87. The solution of the equation $x\frac{dy}{dx}+3y=x$ is

(A) $x^3y+\frac{x^4}{4}+c=0$ (B) $x^3y=\frac{x^4}{4}+c$

(C) $x^3y+\frac{x^4}{4}=0$ (D) None of these

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

(A) $y=\frac{1}{2}(\cos x+\sin x)+ce^{-x}$

(B) $y=\frac{1}{2}(\cos x-\sin x)+ce^{-x}$

(C) $y=\cos x+\sin x+ce^{-x}$

(D) None of these

89. The solution of the differential equation $\frac{dy}{dx}+y\cot x=2\cos x$ is

(A) $y\sin x+\cos 2x=2c$

(B) $2y\sin x+\cos x=c$

(C) $y\sin x+\cos x=c$

(D) $2y\sin x+\cos 2x=c$

90. The solution of the equation $(x+2y^3)\frac{dy}{dx}-y=0$ is

(A) $y(1-xy)=Ax$ (B) $y^3-x=Ay$

(C) $x(1-xy)=Ay$ (D) $x(1+xy)=Ay$

Where A is any arbitrary constant

91. The integrating factor of the differential equation $\frac{dy}{dx}=y\tan x-y^2\sec x$, is

(A) $\tan x$ (B) $\sec x$

(C) $-\sec x$ (D) $\cot x$

92. Integrating factor of differential equation $\cos x\frac{dy}{dx}+y\sin x=1$ is

(A) $\cos x$ (B) $\tan x$

(C) $\sec x$ (D) $\sin x$

93. Solution of differential equation $\frac{dy}{dx}+ay=e^{mx}$ is

(A) $(a+m)y=e^{mx}+c$

(B) $ye^{ax}=me^{mx}+c$

(C) $y=e^{mx}+ce^{-ax}$

(D) $(a+m)y=e^{mx}+ce^{-ax}(a+m)$

94. The integrating factor of the differential equation $(x\log x)\frac{dy}{dx}+y=2\log x$ is

(A) $\log x$ (B) $\log(\log x)$

(C) e^x (D) x

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

(A) $e^{\sin x}$ (B) $\frac{1}{\sin x}$

(C) $\frac{1}{\cos x}$ (D) $e^{\cos x}$

96. The solution of the differential equation $x\log x\frac{dy}{dx}+y=2\log x$ is

(A) $y=\log x+c$

(B) $y=\log x^2+c$

(C) $y\log x=(\log x)^2+c$

(D) $y=x\log x+c$

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

(A) $y=\tan x-1+ce^{-\tan x}$

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

(C) $ye^{\tan x}=\tan x-1+c$

(D) $ye^{-\tan x}=\tan x-1+c$

98. An integrating factor of the differential equation $(1-x^2)\frac{dy}{dx}-xy=1,$ is

(A) $-x$ (B) $-\frac{x}{(1-x^2)}$

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

99. Integrating factor of equation $(x^2+1)\frac{dy}{dx}+2xy=x^2-1$ is

(A) x^2+1 (B) $\frac{2x}{x^2+1}$

(C) $\frac{x^2-1}{x^2+1}$ (D) None of these

100. The solution of $\frac{dy}{dx}+\frac{y}{3}=1$ is

(A) $y=3+ce^{x/3}$ (B) $y=3+ce^{-x/3}$

(C) $3y=c+e^{x/3}$ (D) $3y=c+e^{-x/3}$

101. $y+x^2=\frac{dy}{dx}$ has the solution

(A) $y+x^2+2x+2=ce^x$

(B) $y+x+x^2+2=ce^{2x}$

(C) $y+x+2x^2+2=ce^x$

(D) $y^2+x+x^2+2=ce^x$

102. The solution of $\frac{dy}{dx}+p(x)y=0$ is

(A) $y=ce^{\int p\,dx}$ (B) $x=ce^{-\int p\,dy}$

(C) $y=ce^{-\int P\,dx}$ (D) $x=ce^{\int p\,dy}$

103. 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) $y=xe^{-x}$

104. Integrating factor of the differential equation $\frac{dy}{dx}+P(x)y=Q(x)$ is

(A) $\int P\,dx$ (B) $\int Q\,dx$

(C) $e^{\int P\,dx}$ (D) $e^{\int Q\,dx}$

105. To reduce the differential equation $\frac{dy}{dx}+P(x)y=Q(x).y^n$ to the linear form, the substitution is

(A) $v=\frac{1}{y^n}$ (B) $v=\frac{1}{y^{n-1}}$

(C) $v=y^n$ (D) $v=y^{n-1}$

106. The solution of differential equation $\frac{dy}{dx}+y=1$ is

(A) $y=1+ce^{-x}$ (B) $y=1-ce^{-x}$

(C) $y=x+ce^{-x}$ (D) $y=x-ce^{-x}$

Application of differential equations

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

(A) $x^2+y^2=1$ (B) $x^2-y^2=1$

(C) $2x^2+y^2=2$ (D) None of these

108. Equation of curve passing through (3, 9) which satisfies the differential equation $\frac{dy}{dx}=x+\frac{1}{x^2}$, is

(A) $6xy=3x^2-6x+29$

(B) $6xy=3x^3-29x+6$

(C) $6xy=3x^3+29x-6$

(D) None of these

109. The differential equation $y\frac{dy}{dx} + x = a$ (a is any constant) represents

(A) A set of circles having centre on the y-axis

(B) A set of circles centre on the x-axis

(C) A set of ellipses

(D) None of these

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

(C) $xy = x + 1$ (D) None of these

111. The equation of the curve through the point $(1,0)$ and whose slope is $\frac{y-1}{x^2+x}$ is

(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

112. The slope of a curve at any point is the reciprocal of twice the ordinate at the point and it passes though the point (4, 3). The equation of the curve is

(A) $x^2 = y + 5$ (B) $y^2 = x - 5$

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

113. A particle moves in a straight line with a velocity given by $\frac{dx}{dt} = x + 1$ (x is the distance described). The time taken by a particle to traverse a distance of 99 metre is

(A) $\log_{10} e$ (B) $2\log_e 10$

(C) $2\log_{10} e$ (D) $\frac{1}{2}\log_{10} e$

114. Solution of differential equation $x\,dy - y\,dx = 0$ represents

(A) Rectangular hyperbola

(B) Straight line passing through origin

(C) Parabola whose vertex is at origin

(D) Circle whose centre is at origin

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

(A) – 5/3 (B) – 1

(C) 1 (D) 5/3

116. A particle starts at the origin and moves along the x–axis in such a way that its velocity at the point $(x, 0)$ is given by the formula $\frac{dx}{dt} = \cos^2 \pi x$. Then the particle never reaches the point on

(A) $x = \frac{1}{4}$ (B) $x = \frac{3}{4}$

(C) $x = \frac{1}{2}$ (D) $x = 1$

Miscellaneous differential equations

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

(A) $y = \log x + c_1 x + c_2$

(B) $y = -\log x + c_1 x + c_2$

(C) $y = -\frac{1}{x} + c_1 x + c_2$

(D) None of these

118. The solution of $\frac{d^2y}{dx^2} = \sec^2 x + xe^x$ is

(A) $y = \log(\sec x) + (x-2)e^x + c_1 x + c_2$

(B) $y = \log(\sec x) + (x+2)e^x + c_1 x + c_2$

(C) $y = \log(\sec x) - (x+2)e^x + c_1 x + c_2$

(D) None of these

119. If $\frac{d^2y}{dx^2} = 0$, then

(A) $y = ax + b$ (B) $y^2 = ax + b$

(C) $y = \log x$ (D) $y = e^x + c$

120. If $\frac{d^2y}{dx^2} + \sin x = 0$, then solution of the differential equation is.

(A) $\sin x + c_1 x + c_2$ (B) $\cos x + c_1 x + c_2$

(C) $\tan x + c_1 x + c_2$ (D) $\log \sin x + c_1 x + c_2$