Equations of First order first degree

1. The solution of $(x-y^2)dx+2xydy=0$ is ….

   a) $ye^{y^2/x}=c$ b) $xe^{y^2/x}=c$ c) $ye^{x/y^2}=c$ d) $xe^{x/y^2}=c$

2. The solution of $\frac{dy}{dx}+y\left(\frac{d\phi}{dx}\right)=\phi(x)\left(\frac{d\phi}{dx}\right)$ is ….

   a) $y=\phi(x)-1+ce^{-\phi}$ c) $y=x\phi(x)-ce^{-\phi}$

   b) $y=ce^{\phi}$ d) $y=[\phi(x)-1]e^{-\phi}+c$

3. Primitive of $(2xy^4e^y+2xy^3+y)dx+(x^2y^4e^y-x^2y^2-3x)dy=0$, is ….

   a) $x^2e^y+\frac{x^2}{y}+\frac{x}{y^3}=c$ c) $x^2e^y+\frac{x^2}{y}-\frac{x}{y^3}=c$

   b) $x^2e^y-\frac{x^2}{y}+\frac{x}{y^3}=c$ d) $x^2e^y-\frac{x^2}{y}-\frac{x}{y^3}=c$

4. The solution of $\frac{dy}{dx}+2xy=2xy^2$ is ….

   a) $y=\frac{cx}{1+e^{-x^2}}$ c) $y=\frac{1}{1+ce^{x^2}}$

   b) $y=\frac{1}{1-ce^{-x^2}}$ d) $y=\frac{cx}{1+e^{x^2}}$

5. Which of the following is not an integrating factor of $xdy-ydx=0$?

   a) $\frac{1}{x^2}$ b) $\frac{1}{x^2+y^2}$ c) $\frac{1}{xy}$ d) $\frac{x}{y}$

6. The general solution of $\frac{dy}{dx}+\tan y\tan x=\cos x\sec y$ is ….

   a) $2\sin y=(x+c-\sin x\cos x)\sec x$ c) $\cos y=(x+c)\sin x$

   b) $\sin y=(x+c)\cos x$ d) $\sec y=(x+c)\cos x$

7. If the integrating factor of $(x^7y^3+3y^2)dx+(3x^8y^2-xy)dy=0$ is x^m then …

   a) m=-7 b) m=1 c) m=7 d) m=-1

8. An integrating factor for $(\cos y\sin 2x)dx+(\cos^2 y-\cos^2 x)dy=0$ is …

   a) $\sec^2 y+\sec y\tan y$ c) $\frac{1}{\sec^2 y+\sec y+\tan y}$

   b) $\tan^2 y+\sec y\tan y$ d) $\frac{1}{\tan^2 y+\sec y\tan y}$

9. The equation $(\alpha xy^3+y\cos x)dx+(x^2y^2+\beta\sin x)dy=0$ is exact if …

a) $\alpha = \frac{3}{2}, \beta = 1$ c) $\alpha = \frac{2}{3}, \beta = 1$

b) $\alpha = 1, \beta = \frac{3}{2}$ d) $\alpha = 1, \beta = \frac{2}{3}$

10. Consider the initial value problem (IVP) $\frac{dy}{dx} = y^2, y(0) = 1, (x, y) \in R \times R$. Then there exists a unique solution of the IVP on ….

a) $(-\infty, \infty)$ b) $(-\infty, 1)$ c) $(-2, 2)$ d) $(-1, \infty)$

11. Let $y_1(x)$ and $y_2(x)$ be the solutions of the differential equation $\frac{dy}{dx} = y + 17$ with initial conditions $y_1(0) = 0, y_2(0) = 1$, then ….

a) y_1 and y_2 will never intersect c) y_1 and y_2 will intersect at $x = e$

b) y_1 and y_2 will intersect at $x = 17$ d) y_1 and y_2 will intersect at $x = 1$

12. The differential equation $\frac{dy}{dx} = 60y^{2/5}, x > 0, y(0) = 0$ has …

a) a unique solution c) no solution

b) two solutions d) infinite number of solutions

13. The necessary and sufficient condition for $Mdx + Ndy = 0$ to be exact is …..

a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ c) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$

b) $\frac{\partial^2 M}{\partial x^2} + \frac{\partial^2 N}{\partial y^2}$ d) $\frac{\partial^2 M}{\partial x \partial y}$

14. The integrating factor of $\frac{dy}{dx} + Py = Q$ is ….

a) $e^{\int P dy}$ b) $e^{\int P dx}$ c) $e^{\int Q dy}$ d) $e^{\int Q dx}$

15. If $\frac{\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)}{N}$ is a function of x, say f(x) then …. is an integrating factor.

a) $e^{\int f(y) dy}$ b) $e^{\int f(x) dx}$ c) e^x d) e^y

16. The degree of the differential equation $\left(\frac{d^3 y}{dx^3}\right)^2 + \frac{d^2 y}{dx^2} + \frac{dy}{dx} + 5y = 0$ is ….

a) 3 b) 2 c) 5 d) 1

17. The general solution of differential equation $\frac{dy}{dx} + yx^{-1} = \frac{1}{x}$ is ….

a) $xy = x^2 + c$ c) $xy = 1 + c$

b) $y = 1 + cx^{-1}$ d) $y = x + c$

18. The solution of the differential equation $\frac{ydx - xdy}{y^2} = 0$ is …

a) $\frac{y}{x} = c$ b) $\frac{x+y}{y} = c$ c) $\frac{x}{y} = c$ d) $x + y = c$

19. If $\frac{\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)}{M}$ is a function of y, say f(y) then …. is an integrating factor.

a) $e^{\int f(y)dy}$ b) $e^{\int f(x)dx}$ c) e^x d) e^y

20. If $Mdx + Ndy = 0$ is homogeneous equation in x and y, then I. F.= ….

a) $\frac{1}{Mx + Ny}$, provided that $Mx + Ny \neq 0$ c) $e^{\int f(x)dx}$

b) $e^{\int f(y)dy}$ d) $\frac{1}{Mx - Ny}$, provided that $Mx - Ny \neq 0$

21. The differential equation $y = 2px + F(p^2x)$ can be reduced to Clairaut's form by standard substitution …

a) $x = u^2$ and $y = v$ c) $x = u^3$ and $y = e^v$

b) $x = u^3$ and $y = v^2$ d) $x = e^u$ and $y = v$

22. The solution of differential equation $p = \log(px - y)$ is …

a) $y = cx + e^c$ c) $x = cy + e^c$

b) $y = cx - e^c$ d) $x = cy - e^c$

23. The solution of differential equation $(y - px)(p - 1) = p$ is …

a) $y = px + \frac{p}{p+1}$ c) $y = cx + \frac{p}{p+1}$

b) $y = cx + \frac{c}{c+1}$ d) $y = px - \frac{c}{c+1}$

24. The differential equation $y^2 = pxy + F\left(\frac{py}{x}\right)$ can be reduced to Clairaut's form by standard substitution …

a) $x = u$ and $y = v$ c) $x = u^2$ and $y = v$

b) $x^2 = u$ and $y^2 = v$ d) $x = u$ and $y = v^2$

25. The general solution of differential equation $\sqrt{y - px} = p$ is …

a) $y = cx + c$ c) $y = cx + 1$

b) $y = cx - c^2$ d) $y = cx + c^2$

26. If $y = px + e^p$ then its solution is ….

a) $y = cx + e^p$ c) $y = cx + p^c$

b) $y = cx + e^c$ d) $y = cx + c^e$

27. The general solution of differential equation $(y - px)^{1/3} = p$ is …

a) $y = cx + c^3$ c) $y = cx + c$

b) $y = cx - c^3$ d) $y = cx + c^2$

28. The differential equation $p^4 - 2xyp + 8x^2 = 0$ is of the type ….

a) Solvable for x c) Solvable for y

b) Solvable for p d) Solvable for x and y

29. The solution of $p(p-1) = 0$ is ….

a) $(y-c)(y+x+c) = 0$ c) $(y-c)(y-x-c) = 0$

b) $(y-c)(y+x-c) = 0$ d) $(y+c)(x+c) = 0$

30. The solution of $p^2 - 3p - 10 = 0$ is ….

a) $(y+2x-c)(y+5x-c) = 0$ c) $(y-2x-c)(y+5x-c) = 0$

b) $(y+2x-c)(5y+x+c) = 0$ d) $(y+2x-c)(y-5x-c) = 0$

31. The differential equation $\frac{dy}{dx} = \frac{1}{1+x+y+xy}$ is … type

a) Homogeneous c) linear

b) Exact d) variable separable

32. The integrating factor (I. F.) of the equation $Mdx + Ndy = 0$, which is homogeneous is …

a) $\frac{1}{Mx+Ny}$, provided that $Mx + Ny \neq 0$ c) $e^{\int Mdx}$

b) $e^{\int Ndy}$ d) $\frac{1}{Mx-Ny}$, provided that $Mx - Ny \neq 0$

33. If the equation $Mdx + Ndy = 0$ is not exact but is of the form $yf_1(xy)dx + xf_2(xy)dy = 0$ then its I. F. is …

a) $\frac{1}{Mx+Ny}$, provided that $Mx + Ny \neq 0$ c) $e^{\int Mdx}$

b) $e^{\int Ndy}$ d) $\frac{1}{Mx-Ny}$, provided that $Mx - Ny \neq 0$

34. Which of the following differential equation is linear …

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

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

35. The differential equation of the form $\frac{dy}{dx} + P(x)y = Q(x)y^n$ is called ….

a) Euler's equation c) Bernoulli's equation

b) Leibnitz's linear equation d) Clairaut's equation

36. The equation $(x^2 - ay)dx + (y^2 - ax)dy = 0$ is …

a) Homogeneous c) Exact

b) Variable separable d) Linear

37. Which of the following is Bernoulli's equation?

a) $\frac{dy}{dx} = \sin(x + y)$ c) $(x^2 + y^2)dx - 2xydy = 0$

b) $\cos^2 x \frac{dy}{dx} + y = \tan x$ d) $\frac{dy}{dx} + xy = x^3 y^3$

38. The I. F. of the equation $y(1 + xy)dx + x(1 - xy)dy = 0$ is …

a) $\frac{1}{xy}$ b) $\frac{1}{x^2 y^2}$ c) $\frac{1}{2x^2 y^2}$ d) $\frac{1}{2xy}$

39. The integrating factor (I. F.) of the equation $(x^2 - y^2 + 1)dx + 2xydy = 0$ is …

a) $\frac{1}{x^2}$ b) x^2 c) x^2 d) $\frac{1}{y^2}$

40. The integrating factor (I. F.) of the equation $(x^2 y)dx - (x^3 + y^3)dy = 0$ is …

a) $\frac{1}{x^4}$ b) $\frac{1}{y^4}$ c) $-\frac{1}{y^4}$ d) y^4

41. Which of the following is not exact differential equation ?

a) $(x^2 + y^2 + 1)dx + 2xydy = 0$ c) $2xydx + (y^2 - x^2)dy = 0$

b) $(y^2 - ax)dy + (x^2 - ay)dx = 0$ d) $3x^2 ydx + x^3 dy = 0$

42. The integrating factor of the equation $(1 + x^2)\frac{dy}{dx} + 2xy = \frac{1}{1 + x^2}$ is …

a) x^2 b) e^{x^2} c) $1 + x^2$ d) $\frac{1}{1 + x^2}$

43. The integrating factor of the equation $(x + 2y^3)\frac{dy}{dx} = y$ is …

a) x b) $\frac{1}{x}$ c) y d) $\frac{1}{y}$

44. The I. F. of the linear equation $(x + y + 1)\frac{dy}{dx} = 1$ is ….

a) e^x b) e^{-x} c) e^y d) e^{-y}

45. Which of the following is the Bernoulli's equation ?

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

b) $\frac{dy}{dx} + xy = x^3 y^3$ d) $\frac{dy}{dx} + y \tan x = \sec x$

46. The equation $ydx-\left(x+2y^2\right)dy=0$ becomes exact when multiplied by I. F. = …

a) y^2 b) $\frac{1}{y^2}$ c) x^2 d) $\frac{1}{x^2}$

47. The differential equation $\left(x^2-3xy^2\right)dx+\left(1+6y^2-3x^2y\right)dy=0$ is …

a) Exact b) linear c) homogeneous d) variable separable

48. The integrating factor of the equation $\left(x^2+y^2\right)dx+xydy=0$ is …

a) x b) $\frac{1}{x}$ c) y d) $\frac{1}{y}$

49. The I. F. of the equation $x^2ydx-\left(x^3+y^3\right)dy=0$ is …

a) y^4 b) $\frac{1}{y^4}$ c) x^4 d) $\frac{1}{x^4}$

50. The integrating factor of the equation $\cos^2 x\frac{dy}{dx}+y=\tan x$ is …

a) e^x b) $e^{-\tan x}$ c) $e^{\tan x}$ d) e^{-x}

51. The equation $\left(x^3y^3+xy\right)\frac{dy}{dx}=1$ is … type

a) Linear b) homogeneous c) exact d) Bernoulli's

52. The equation $x\frac{dy}{dx}+y\log y=xye^x$ becomes linear by using substitution …

a) $z=\frac{1}{y}$ b) $z=e^x$ c) $z=\log y$ d) $z=\frac{1}{x}$

53. The equation $\left(1+y^2\right)dx+\left(x-e^{-\tan^{-1}y}\right)dy=0$ is of the type …

a) Exact b) linear c) homogeneous d) variable separable

54. The equation $\left(x^2-2xy-y^2\right)dx+\left(x+y\right)^2dy=0$ is of the type …

a) Exact b) linear c) homogeneous d) variable separable

55. The solution of the differential equation $y=px+f(p)$ is ….

a) $y=cx-f(c)$ c) $y=cx+f(c)$

b) $y=cx+f(x)$ d) $y=px+f(c)$

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

a) $y=cx+c^2$ c) $y=cx+x^2$

b) $y=cx-c^2$ d) $y=cx^2$

57. The solution of the differential equation $x+py=0$ represents a family of ….

a) Hyperbolas b) circles c) ellipses d) straight lines

58. The solution of the equation $p^2-7p+12=0$ is …

a) $(y-3x-c)(y-4x-c)=0$ c) $(y+3x+c)(y-4x-c)=0$

b) $(y-6x-c)(y-3x-c)=0$ d) $y=2x+c$

59. The solution of the equation $\tan(y-px)=p$ is …

a) $y=cx-\tan^{-1}c$ c) $y=cx+\tan c$

b) $y=cx+\tan^{-1}c$ d) $y=cx+(\tan^{-1}c)^2$

60. The solution of the differential equation $y=px+(1-p^2)$ is ….

a) $y=cx+1+c^2$ c) $y=cx+(1+c)^2$

b) $y=cx+1-c^2$ d) $y=cx+(1-x)^2$

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

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

b) $y=cx+(1-c^2)$ d) $y=cx+(1-c)^2$

62. The solution of the differential equation $y=px+\sin^{-1}p$ is …

a) $y=cx+\sin c$ c) $y=cx-\sin^{-1}c$

b) $y=cx+\sin^{-1}c$ d) $y=cx-\sin c$

63. The equation of the form $y=px+f(p)$

a) Linear b) Bernoulli's c) Clairaut's d) De Moivres

64. The solution of the equation $p=\tan(px-y)$ is …

a) $c=\tan(cx-y)$ c) $y=\tan^{-1}c$

b) $y=\tan cx$ d) $y=cx-\tan^{-1}c$

65. How many arbitrary constants are there in the general solution of ….

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

a) 2 b) 1 c) 3 d) 0

66. The differential equation $p^3-p(y+3)+x=0$ is of the type …

a) Solvable for y c) solvable for x

b) Solvable for p d) none of these

67. The solution of the equation $p^2-9p+18=0$ is ….

a) $(y-6x-c)(y-3x-c)=0$ c) $(y+9x-c)(y-2x-c)=0$

b) $(y+6x-c)(y-3x-c)=0$ d) $(y-9x-c)(y-2x-c)=0$

68. The solution of differential equation $p^3x+p^2y-p^2x-py=0$ is …

a) $(y-c)(y+x-c)=0$ c) $(y-c)(y+x+c)(x+y+c)=0$

b) $(y-c)(y-x-c)(xy-c)=0$ d) $(y-c)(y+x-c)(x-c)=0$

69. The solution of differential equation $y^2 = pxy + \frac{p^2y^2}{x^2}$ is ….

a) $y^2 = cx^2 + c^2$ c) $y = cx^2 + c^2$

b) $y^2 = cx + c$ d) $y = cx + c^2$

70. The solution of differential equation $\sqrt{y + px} = p$ is …

a) $y = -cx + c^2$ c) $y = cx + c$

b) $y = cx + c^2$ d) $y = cx^2 + c$

71. The general solution of the equation $4xp^2 = (3x - a)^2$ is …

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

b) $y^2 = x(x - a)^2$ d) $(y + c)^2 = x^2$

72. The general solution of Clairaut's equation represents family of …

a) Circles b) hyperbolas c) parabolas d) straight lines

73. The solution of differential equation $x = y + k\log p$ is ….

a) $y = cx + k\log c$ c) $y = cx + k\log p$

b) $y = cx - k\log c$ d) $y = cx - k\log p$

74. The solution of the differential equation $\cos y\cos px + \sin y\sin px = p$ is …

a) $y = cx + \cos^{-1} c$ c) $y = cx + \sin^{-1} c$

b) $y = cx - \cos^{-1} c$ d) $y = cx - \sin^{-1} c$

75. The solution of the equation $(p - x)(p - y) = 0$ is of the form …

a) $\left(y - \frac{x^2}{2} - c\right)(\log y - x - c) = 0$ c) $(y - x^2 - c)(\log y - x - c) = 0$

b) $(y - x - c)(\log y - x - c) = 0$ d) $(y - x^2 - c)(y - x - c) = 0$

Linear Differential equations with constant coefficients

1) Let D=d/dx, then the value of $\left\{\frac{1}{xD+1}\right\}x^{-1}$ is ….

a) $\log x$ b) $\frac{\log x}{x}$ c) $\frac{\log x}{x^2}$ d) $\frac{\log x}{x^3}$

2) Let $y(x)$ be the solution of the initial value problem $x^2y'' + xy' + y = x$, $y(1) = y'(1) = 1$. Then, the value of $y(e^{\pi/2})$ is ….

a) $\frac{1 - e^{\pi/2}}{2}$ b) $\frac{1 + e^{\pi/2}}{2}$ c) $\frac{1}{2} + \frac{\pi}{4}$ d) $\frac{1}{2} - \frac{\pi}{4}$

3) A particular solution of $4x^2\frac{d^2y}{dx^2} + 8x\frac{dy}{dx} + y = \frac{4}{\sqrt{x}}$ is ….

a) $\frac{1}{2\sqrt{x}}$ b) $\frac{\log x}{2\sqrt{x}}$ c) $\frac{(\log x)^2}{2\sqrt{x}}$ d) $\frac{(\log x)\sqrt{x}}{2}$

4) Consider the initial value problem $x^2y''-6y=0,\ y(1)=\alpha,\ y'(1)=6$. If $y(x)\to 0$ as $x\to 0$ then α is equal to ….

a) -2 b) 2 c) 1 d) -1

5) The minimum possible order of homogeneous linear ordinary differential equation with real constant coefficients having $x^2\sin x$ as a solution is equal to ….

a) 4 b) 5 c) 6 d) 7

6) Let $y_1(x)$ and $y_2(x)$ form a complete set of solution of the differential equation $y''-6y'+9y=\frac{e^{3x}}{x^2}$ then the Wronskian $W(x)$ of $y_1(x)$ and $y_2(x)$ is …

a) e^{3x} b) e^{6x} c) e^{-3x} d) e^{-6x}

7) A particular integral of $\frac{d^2y}{dx^2}-(a+b)\frac{dy}{dx}+aby=Q(x)$ is …

a) $e^{ax}\int\left\{e^{(a-b)x}\left(\int Qe^{bx}dx\right)\right\}dx$ c) $e^{-ax}\int\left\{e^{(b-a)x}\left(\int Qe^{bx}dx\right)\right\}dx$

b) $e^{ax}\int\left\{e^{(b-a)x}\left(\int Qe^{-bx}dx\right)\right\}dx$ d) $e^{-ax}\int\left\{e^{(b-a)x}\left(\int Qe^{-bx}dx\right)\right\}dx$

8) The solution of $\frac{d^2s}{dt^2}=g$. (g is a constant, $s=0$ and $\frac{ds}{dt}=u$ when $t=0$), is …

a) $s=gt$ b) $s=ut+\frac{1}{2}gt^2$ c) $s=\frac{1}{2}gt^2$ d) none of these

9) The solution of $\frac{d^2y}{dx^2}-y=k$, (k= a non-zero constant) which vanishes when x=0 and tends to finite limit as x tends to infinity is …

a) $y=k(1+e^{-x})$ c) $y=k(e^x+e^{-x}-2)$

b) $y=k(e^{-x}-1)$ d) $y=k(e^x-1)$

10) If $e^{ax}u(x)$ is a particular integral of $\frac{d^2y}{dx^2}-2a\frac{dy}{dx}+a^2y=f(x)$, where a is a constant, then $\frac{d^2u}{dx^2}$ is equal to …

a) $f(x)$ b) $f(x)e^{ax}$ c) $f(x)e^{-ax}$ d) $f(x)[e^{ax}+e^{-ax}]$

11) If $y=\phi(x)$ is a particular solution of $y''+(\sin x)y'+2y=e^x$ and $y=\varphi(x)$ is a particular solution of $y''+(\sin x)y'+2y=\cos 2x$, then a particular solution of $y''+(\sin x)y'+2y=e^x+2\sin^2 x$, is given by …

a) $\phi(x)-\varphi(x)+\frac{1}{2}$ c) $\phi(x)-\varphi(x)+1$

b) $\varphi(x)-\phi(x)+\frac{1}{2}$ d) $\varphi(x)-\phi(x)+1$

12) The set of linearly independent solutions of the differential equation $\frac{d^4y}{dx^4}-\frac{d^2y}{dx^2}=0$ is …

a) $\{1,x,e^x,e^{-x}\}$ c) $\{1,x,e^x,xe^x\}$

b) $\{1,x,e^{-x},xe^{-x}\}$ d) $\{1,x,e^x,xe^{-x}\}$

13) All real solutions of the differential equation $y''+2ay'+by=\cos x$ (where a and b are real constants) are periodic if …

a) $a=1\ and\ b=0$ c) $a=1\ and\ b\neq 0$

b) $a=0\ and\ b=1$ d) $a=0\ and\ b\neq 1$

14) Let $y(x)$ be the solution of the initial value problem $y'''-y''+4y'-4=0$, $y(0)=y'(0)=2$ and $y''(0)=0$. Then value of $y\left(\frac{\pi}{2}\right)$ is …

a) $\frac{4^{\pi/2}-6}{5}$ b) $\frac{6^{\pi/2}-4}{5}$ c) $\frac{8^{\pi/2}-2}{5}$ d) $\frac{8^{\pi/2}+2}{5}$

15) Suppose $y_p(x)=x\cos 2x$ is a particular solution of $y''-\alpha y=-4\sin 2x$. Then the constant α equals …

a) -4 b) -2 c) 2 d) 4

16) The solution of the initial value problem $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+5y=3e^{-t}\sin t$, $y(0)=0$ and $y'(0)=3$ is …

a) $y(t)=e^t(\sin t+\sin 2t)$ c) $y(t)=3e^t\sin t$

b) $y(t)=e^{-t}(\sin t+\sin 2t)$ d) $y(t)=3e^{-t}\sin t$

17) The particular integral (P. I.) of $(D-a)^2y=e^{ax}$ is …

a) a^2e^{ax} b) $\frac{x^2}{2}e^{ax}$ c) x^2e^{ax} d) $\frac{x}{2}e^{ax}$

18) The P. I. of $(D^2-4)y=\sin 4x$ is …

a) $\frac{x}{20}\sin 4x$ b) $\frac{\sin 4x}{8}$ c) $-\frac{\sin 4x}{20}$ d) $-\frac{x}{8}\cos 4x$

19) The value of $\frac{1}{D^2+2}\sin x$ is ….

a) $-\cos x$ b) $-\sin x$ c) $\frac{\sin x}{3}$ d) $\sin x$

20) The value of $\frac{1}{D^2+3D+2}e^{-x}$ is …

a) $\frac{1}{2}e^{-x}$ b) $\frac{1}{2}xe^{-x}$ c) xe^{-x} d) none of these

21) The value of $\frac{1}{(D-2)^3}e^{2x}$ is …

a) xe^{2x} b) $\frac{1}{2}x^2e^{2x}$ c) $\frac{1}{3}x^3e^{2x}$ d) $\frac{1}{6}x^3e^{2x}$

22) The P. I. of $(D^2+3)y=\sin^2 x$ is …

a) $\frac{1}{6}+\frac{1}{2}\cos 2x$ b) $\frac{1}{2}\sin 2x$ c) $\frac{1}{6}-\frac{1}{2}\cos 2x$ d) none of these

23) The P. I. of $(D^2+4)y=\cos 2x$ is …

a) $\frac{x}{2}\cos 2x$ b) $\frac{x}{4}\cos 2x$ c) $\frac{x}{4}\sin 2x$ d) $-\frac{x}{4}\cos 2x$

24) The value of $\frac{1}{D^2+1}\cos x$ is …

a) $x\cos x$ b) $x\sin x$ c) $\frac{x}{2}\cos x$ d) $-x\cos x$

25) $\frac{1}{D+2}\sin x=....$

a) $\frac{2\cos x-\sin x}{3}$ c) $\frac{2\sin x-\cos x}{3}$

b) $\frac{2\sin x+\cos x}{3}$ d) none of these

26) $\frac{1}{D^2+a^2}\sin x=...$

a) $-\frac{x}{2a}\cos ax$ c) $-\frac{x}{2a}\sin ax$

b) $\frac{x}{2a}\sin ax$ d) $\frac{x}{2a}\cos ax$

27) P. I. of $(D^2+4)y=\cos 2x+\sin 2x$ is …

a) $\frac{x}{4}(\cos 2x-\sin 2x)$ c) $\frac{x}{2}(\cos 2x-\sin 2x)$

b) $\frac{x}{4}(\cos 2x+\sin 2x)$ d) $\frac{x}{8}(\cos 2x+\sin 2x)$

28) P. I. of $D^2(D^2+4)y=\sin 2x$ is …

a) $\frac{x}{16}\sin 2x$ b) $\frac{x}{16}\cos 2x$ c) $-\frac{x}{16}\sin 2x$ d) $-\frac{x}{16}\cos 2x$

29) The P. I. of $(D-a)^2 y = e^{ax}$ is …

a) $\frac{e^{ax}}{2a}$ b) $\frac{x^2}{2}e^{ax}$ c) $\frac{x}{2}e^{ax}$ d) $\frac{x^3}{3!}e^{ax}$

30) The value of $\frac{1}{f(D)}\left(e^{ax}V\right) = \ldots$

a) $e^{ax}\frac{1}{f(D)}V$ c) $e^{ax}\frac{1}{f(D+a)}V$

b) $e^{ax}\frac{1}{f(D-a)}V$ d) none of these

31) The P. I. of $(D+2)^2 y = x^2$ is ….

a) $x^2 - 2x + \frac{3}{4}$ c) $\frac{1}{4}\left(x^2 + 2x - \frac{3}{4}\right)$

b) $\frac{1}{4}\left(x^2 - 2x + \frac{3}{4}\right)$ d) $\frac{1}{4}\left(x^2 - 2x - \frac{3}{4}\right)$

32) The P. I. of $(D+1)y = xe^{-x}$ is …

a) $\frac{xe^{-x}}{2}$ b) $\frac{x^2e^{-x}}{2}$ c) $\frac{x^2e^{x}}{2}$ d) $\frac{xe^{-x}}{4}$

33) The P. I. of $(D+1)^2 y = e^{-x}\sin x$ is ….

a) $-\frac{e^{-x}\cos x}{2}$ b) $e^{-x}\cos x$ c) $-e^{-x}\cos x$ d) $-e^{-x}\sin x$

34) The P. I. of $(D-1)y = \cosh x$ is …

a) $xe^{x} - \frac{e^{-x}}{2}$ c) $\frac{1}{2}\left(xe^{-x} - \frac{e^{x}}{2}\right)$

b) $\frac{1}{2}\left(xe^{x} - \frac{e^{-x}}{2}\right)$ d) none of these

35) The P. I. of $(D-1)^2 y = x$ is …

a) $x-1$ b) $x+2$ c) x^2+2 d) $1-x$

36) The P. I. of $f(D)y = xV$, where V is a function of x is …

a) $x\left[\frac{f'(D)}{f(D)}\right]V$ c) $\left[x - \frac{f'(D)}{f(D)}\right]V$

b) $\left[x - \frac{f'(D)}{f(D)}\right]\frac{1}{f(D)}V$ d) $x\left[1 - \frac{f'(D)}{f(D)}\right]\frac{1}{f(D)}V$

37) The value of $\frac{1}{D^2+2}(x\cos x)$ is …

a) $x\cos x+\sin x$ c) $x\cos x+2\sin x$

b) $x\cos x-2\sin x$ d) none of these

38) The P. I. of $(D-2)^2 y = x^2 e^{2x}$ is …

a) $\frac{x^2e^{2x}}{4}$ b) $\frac{x^4e^{2x}}{4}$ c) $\frac{x^4e^{2x}}{8}$ d) $\frac{x^4e^{2x}}{12}$

39) The P. I. of $(D+1)(D+2)y = e^x \cos x$ is …

a) $\frac{e^x}{10}(\cos x-\sin x)$ c) $\frac{e^x}{10}(\cos x+\sin x)$

b) $\frac{e^x}{5}(\cos x+\sin x)$ d) $\frac{e^x}{5}(\cos x-\sin x)$

40) The P. I. of $(2D^2+5D+2)y = \cos x$ is …

a) $\sin x$ b) $\frac{1}{5}\cos x$ c) $\frac{1}{5}\sin x$ d) $-\frac{1}{5}\sin x$

41) The P. I. of $(D^3+3D^2+3D+1)y = x^2e^{-x}$ is …

a) $\frac{x^5e^{-x}}{60}$ b) $\frac{x^6e^{-x}}{120}$ c) $\frac{x^4e^{-x}}{24}$ d) none of these

42) The C. F. of the equation $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y = e^{2x}$ is …

a) $y = c_1e^x + c_2e^{2x}$ c) $y = c_1e^{-x} + c_2e^{-2x}$

b) $y = c_1e^x + c_2e^{-2x}$ d) $y = c_1e^{-x} + c_2e^{2x}$

43) The C. F. of $(D^2+4)y = \tan 2x$ is …

a) $y = c_1\cos x + c_2\sin x$ c) $y = e^{2x}(c_1\cos 2x + c_2\sin 2x)$

b) $y = c_1\cos 2x + c_2\sin 2x$ d) $y = e^{2x}(c_1\cos x + c_2\sin x)$

44) The C. F of the equation $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y = 2e^{2x}$ is …

a) $y = c_1 + c_2x$ c) $y = (c_1+c_2x)e^{2x}$

b) $y = (c_1+c_2x)e^x$ d) $y = c_1e^x + c_2e^{2x}$

45) The solution of the equation $(D^2-3D+2)y = e^{3x}$ is …

a) $y = c_1e^x + c_2e^{2x} + \frac{e^{3x}}{4}$ c) $y = c_1e^x + c_2e^{2x} + \frac{e^{3x}}{2}$

b) $y = c_1e^x + c_2e^{2x} + \frac{e^{3x}}{3}$ d) $y = c_1e^x + c_2e^{2x} + e^{3x}$

46) The C. F. of the equation $(D^3+3D^2+3D+1)y = e^{-x}$ is …

a) $y = (c_1 + c_2 x + c_3 x^2)e^{-x}$ c) $y = (c_1 + c_2 x + c_3 x^2)e^{2x}$

b) $y = (c_1 + c_2 x + c_3 x^2)e^{x}$ d) none of these

Homogeneous Linear Differential Equations

1) The homogeneous linear equation can be reduced to linear equation with constant coefficient by using the substitution …

a) $x = e^z$ b) $z = e^x$ c) $x = e^{-z}$ d) $z = e^{-x}$

2) The homogeneous linear equation can be reduced to linear equation with constant coefficients by using substitution …

a) $x = \log z$ b) $x = e^z$ c) $x = \frac{1}{z}$ d) $x = z^2$

3) The differential equation $\frac{d^2y}{dx^2} + \frac{1}{x^2}y = 1$ is … equation.

a) Homogeneous linear c) linear equation with constant coefficients

b) Non-homogeneous d) exact differential

4) By using substitution $z = \log x$, a homogeneous linear differential equation can be reduced to …

a) Second order linear equation c) exact differential equation

b) Linear differential equation with constant d) Total differential equation

5) The differential equation $x^3\frac{d^2y}{dx^2} - 2x^2\frac{dy}{dx} + 2xy = 1$ is … equation.

a) Linear equation with constant coefficient

b) Second order linear equation

c) Homogeneous linear equation

d) Total differential equation

6) The differential equation $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} + \frac{4}{x^2}y = x$ is of type …

a) Second order linear

b) Linear differential equation with constant coefficient

c) Exact differential equation

d) Homogeneous linear differential equation

7) The complementary function (C. F.) of the equation $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x$ is …

a) $y = c_1 x + c_2 x^2$ c) $y = c_1 x^3 + c_2 x^4$

b) $y = c_1 x^2 + c_2 x^3$ d) $y = c_1 x + c_2 x^6$

8) The equation $(3+2x^2)\frac{d^2y}{dx^2}+5(3+2x)\frac{dy}{dx}+6y=x^2$ is … equation.

a) Homogeneous linear
b) Reducible to homogeneous
c) Linear equation with constant coefficient
d) Second order linear

9) By using substitution $x=e^z$ the value of $x^2\frac{d^2y}{dx^2}$ in the homogeneous linear equation is …

a) D^2 b) $D(D+1)$ c) $D(D-1)$ d) $(D-1)(D-2)$

10) The complementary function (C. F.) of the equation $x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+y=\frac{1}{x}$ is …

a) $y=c_1x+\frac{c_2}{x}$ c) $y=\frac{1}{x}(c_1+c_2\log x)$

b) $y=c_1+c_2\log x$ d) $y=\frac{c_1}{x}+\frac{c_2}{x^2}$

11) The homogeneous linear differential equation is reduced to linear differential equation with constant coefficients by using substitution $z=\log x$ to the form $f(D)y=X$ where $D=...$

a) $\frac{d}{dx}$ b) $\frac{d}{dy}$ c) $\frac{d}{dz}$ d) $\frac{dy}{dx}$

12) By using the substitution $x=e^z$, the value of $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}$ in the homogeneous linear differential equation is …

a) $D(D-1)$ c) $D(D+1)$

b) $D(D+2)$ d) D^2

13) The solution of the homogeneous linear equation $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}-3y=0$ is …

a) $y=c_1x^3+\frac{c_2}{x}$ c) $y=c_1e^{3x}+c_2e^{-x}$

b) $y=c_1x^3+c_2x$ d) $y=c_1x+\frac{c_2}{x^3}$

14) By using the substitution $z=\log x$, the value of $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}$ in the homogeneous linear differential equation is …

a) $D(D-1)$ c) $D(D+1)$

b) $D(D+2)$ d) D^2

15) The solution of the homogeneous linear equation $x^2 \frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 2y = 0$ is …

a) $y = c_1 x + c_2 x^2$

b) $y = c_1 x + \frac{c_2}{x^2}$

c) $y = c_1 x^2 + \frac{c_2}{x}$

d) $y = c_1 e^x + c_2 e^{-2x}$

16) By using the substitution $x = e^z$, the value of $x^3 \frac{d^3y}{dx^3}$ in the homogeneous linear differential equation is …

a) $(D-1)(D-2)(D-3)$

b) $D(D-1)(D-2)$

c) $D^2(D-1)$

d) D^3

17) The differential equation $x^3 \frac{d^3y}{dx^3} + x^2 \frac{d^2y}{dx^2} + y = \frac{1}{x}$ is …

a) Linear equation with constant coefficient
b) Homogeneous linear equation
c) Reducible to homogeneous equation
d) Exact differential equation