Solve the following differentials equations

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

2. $y \sec^2 x \, dx + (y+7) \tan x \, dy = 0$

3. $\dfrac{dy}{dx} = \dfrac{x(2\log x + 1)}{\sin y} + y\cos y$

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

5. $(x^2 - yx^2)dy + (y^2 + xy^2)dx = 0$

Solve the homogeneous diff. Eq.

6. $(x^3 + y^3)dx - 3xy^2 dy = 0$

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

8. $(x^2 + xy - y^2)\, dy + (2xy - 3y^2)dx = 0$

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

10. $x^2 \dfrac{dy}{dx} = y(x+y)/2$

11. $(x^2 - y^2)\, dx + 2xy\, dy = 0$

12. $\dfrac{dy}{dx} = \dfrac{(x^2 - xy + y^2)}{xy}$

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

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

15. $(\, x + y\cot x/y\,)\, dy - y\, dx = 0$

Solve the Non-homogeneous diff. Eq.

16. $\dfrac{dy}{dx} = \dfrac{(2x - 5y + 3)}{(2x + 4y - 6)}$

17. $(2x - y + 1)\,dx + (2y - x - 1)\,dy = 0$

18. $\dfrac{dy}{dx} = \dfrac{(6x - 4y + 3)}{(3x - 2y + 1)}$

19. $\dfrac{dy}{dx} = \dfrac{(x + y + 1)}{(x + y - 1)}$

20. $\dfrac{dy}{dx} = \dfrac{(x + 2y + 1)}{(2x + 4y - 6)}$

21. $\dfrac{dy}{dx} = \dfrac{(x + 2y + 3)}{(2x + 3y + 4)}$

22. $\dfrac{dy}{dx} = \dfrac{(y - x + 1)}{(y + x + 5)}$

23. $\dfrac{dy}{dx} = \dfrac{(2x - y + 1)}{(x + 2y - 3)}$

24. $\dfrac{dy}{dx} = \dfrac{(4x - 6y + 3)}{(6x - 9y - 1)}$

Solve the exact diff. Eq.

25. $(2x^2 + 3y)\,dx + (3x + y - 1)\,dy = 0$

26. $\dfrac{dy}{dx} + \dfrac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$

27. $(x^2 + y^2 - a^2)\,x\,dx + (x^2 - y^2 - b^2)\,y\,dy = 0$

28. $(1 + e^{\frac{x}{y}})\,dx + [e^{\frac{x}{y}}(1 - x/y]\,dy = 0$

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

30. $(x^2 - 4xy - 2y^2)\,dx + (y^2 - 4xy + 2x^2)\,dy = 0$

31. $(e^y + 1)\cos x\,dx + e^y\sin x\,dy = 0$

32. $(\sin x\cos y + e^{2x})\,dx + (\cos x\sin y + \tan y)\,dy = 0$

33. $[x\sqrt{x^2 + y^2} - y]\,dx + [y\sqrt{x^2 + y^2} - x]\,dy = 0$

34. $[\cos x\,\tan y + \cos(x + y)]\,dx + [\sin x\,\sec^2 y + \cos(x + y)]\,dy = 0$

Solve the Non-exact diff. Eq.

35. $(x^2y - 2xy^2)\,dx - (x^3 - 3x^2y)\,dy = 0$

36. $(x^2 - 5xy + 7y^2)\,dx + (5x^2 - 7xy)\,dy = 0$

37. $(x^2y^2 + 4xy + 2)\,x\,dx - (x^2y^2 + 5xy + 2)\,y\,dy = 0$

38. $(3xy^2 - y^3)\,dx - (2x^2y - xy^2)\,dy = 0$

39. $(1 + xy)\,ydx + (1 - xy)\,xdy = 0$

40. $(xy\,\sin xy + \cos xy)\,ydx + (xy\,\sin xy - \cos xy)\,xdy = 0$

41. $y(xy + 1)\,dx + x(1 + xy + x^2y^2)\,dy = 0$

42. $(xy + 2x^2y^2)\,ydx + (xy - x^2y^2)\,xdy = 0$

43. $(1/x+y)\,dx + (1/y-x)\,dy = 0$

44. $(x^4y^4 + x^2y^2 + xy)\,ydx + (x^4y^4 - x^2y^2 + xy)\,xdy = 0$

45. $(x^2 + y^2)\,dx - 2xy\,dy = 0$

46. $(x^2y^2 + 2xy + 1)\,ydx + (x^2y^2 - xy + 1)\,xdy = 0$

47. $(1 + xy)\,ydx + (1 - xy)\,xdy = 0$

48. $(xy^3 + y)\,dx + 2(x^2y^2 + x + y^4)\,dy = 0$

49. $(y^4 + 2y)\,dx + (xy^3 + 2y^4 - 4x)\,dy = 0$

50. $(x - y^2)\,dx + 2xy\,dy = 0$

51. $(3x^2y^4 + 2xy)\,dx + (2x^2y^3 - x^2)\,dy = 0$

52. $(x^2y + y^3)\,dx + (2/3\ x^3 + 4xy^2)\,dy = 0$

53. $(x^4e^x - 2mxy^2)\,dx + 2mx^2y\,dy = 0$

54. $(x^2 + y^2 + x)\,dx + xy\,dy = 0$

55. $(x^2 + y^2 + 2x)\,dx + 2y\,dy = 0$

56. $(x - y^2)\,dx + 2xy\,dy = 0$

57. $(x^3 + xy^4)\,dx + 2y^3\,dy = 0$

58. $(2y^2 + 3xy - 2y + 6x)\,dx + x(x + 2y - 1)\,dy = 0$

59. $2y\,(x + y + 2)\,dx + (y^2 - x^2 - 4x - 1)\,dy = 0$

60. $(7x^4y + y + 2)\,dx + (x^4 + xy)\,x\,dy = 0$

Solve the Linear diff. Eq.

61. $\dfrac{dy}{dx} - 2y = e^{2x}$

62. $\dfrac{dy}{dx} + x^2y = x^5$

63. $\sin x \dfrac{dy}{dx} + 3y = \cot x$

64. $\dfrac{dy}{dx} + 2xy + xy^4 = 0$

65. $3y^2 \dfrac{dy}{dx} + 2xy^3 = 4xe^{-x^2}$

66. $(x^2y^3 - xy)\, dy = dx$

67. $xy - \dfrac{dy}{dx} = y^3 e^{-x^2}$

68. $\dfrac{dy}{dx} = x(x^2 - 2y)$

69. $\dfrac{dy}{dx} = (2x + 3y - 7)^2$

70. $\cos x \dfrac{dy}{dx} + 2y \sin x = \sin x \cos x$

Solve the following diff. Eq. for x, y, p

71. $p^2 - 5p + 6 = 0$

72. $p - 1/p = x/y - y/x$

73. $p(p + y) = x(x + y)$

74. $p(p - y) = x(x + y)$

75. $p^2 - 7p + 12 = 0$

76. $2y = ax/p + px$

77. $4y = x^2 + p^2$

78. $3x - y + \log p = 0$

79. $y = 2px + x^2 p^4$

80. $y - 2px = f(xp^2)$

81. $y = 2px + p^2 y$

82. $p^3 - 2xyp + 4y^2 = 0$

83. $y = 3px + 6y^2 p^2$

84. $y = 2px + y^2 p^3$

85. $xyp^2 + (x^2 + xy + y^2)p + x(x + y) = 0$

86. $3x - y + \log p = 0$

87. $y = (1 + p)x + p^2$

88. $y^2 \log y = xyp + p^2$

89. $xp^3 = m + np$