Review Problems for Differential Equations

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1. $xy\,y' - 2y^2 + 2x^2 = 0\,.$

2. $y' - y^2 \sin^2 x = x^2 y^2\,.$

3. $\left(e^{x^2} + e^{y^2}\right) y\,y' + e^{x^2}(xy^2 - x) = 0\,.$

4. $y' \cos^2 x + 3y - 1 = 0\,.$

5. $3x \cos y - y' e^{-3x} \sin y + \cos y = 0\,.$

6. $-2y^3 + 3xy^2\,y' - x^3 e^{2x} = 0\,.$

7. $y'' - 2y' - 8y = e^{-2x}\,.$

8. $y'' + 4y' + 7y = 5x\,.$

9. $y'' - y' - 20y = \sin 3x\,.$

10. $y^2 y' - xy' - y + x^2 = 0$

11. $xy' - 2y - x^2 = 0$

12. $2xy' + xy^3 - y = 0$

13. $2x^2 y' - y^2 - 2xy - 3x^2 = 0$

14. $xyy' - 2yy' - 3xy^2 - x = 0$

15. $y' \tan y + x^2 y' \sec^2 y + 2x \tan y + \sec^2 x = 0$

16. $y'' - 4y' + 9y = x$

17. $y'' - 10y' + 25y = 3$

18. $y'' + 4y' + 3y = e^{-x}$

19. $y' - 2xy = 3x$

20. $(x^3 + 8)\, y' - x^2 \cos^2 y = 0$

21. $2x \ln y + \dfrac{x^2 y'}{y} + \dfrac{y'}{y^2 + 3} = 0$

22. $xy' - 2y = x^4 \cos x$

23. $x^4 - 2xy^2 + x^2 yy' = 0$

24. $x^2 y' - y^2 - xy + 4x^2 = 0$

25. $y'' + y' + y = \sin 2x$

26. $y'' - y' - 12y = e^{-3x}$

27. $y' - 5x^2 - x^2 y^2 = 0\,.$

28. $3xyy' - 4y^2 + xy + 2x^2 = 0$

29. $\sin 3x + 5e^{5x} \sin y^2 + 2yy' e^{5x} \cos y^2 + y' \sec 4y = 0$

30. $(x^2+6)y' + 8xy - 4x = 0\,.$

31. $e^x \cos y - y' e^{-3x} \sin y + \cos y = 0\,.$

32. $x^2 + y^4 - xy^3 y' = 0\,.$

33. $y'' - 2y' - 15y = e^{-3x}\,.$

34. $y'' + 6y' + 14y = 6x + 2\,.$

35. $y'' - 6y' + 13y = xe^{-x}$

36. $xy' - 3y = x^4 e^{2x}$

37. $y'' - 8y' + 16y = x^2$

38. $\dfrac{-2y}{x^3} - \sin^2 x + \dfrac{y'}{x^2} + yy' = 0$

39. $x^2 y' - y^2 - xy - 4x^2 = 0$

40. $yy' + xyy' + y^2 + 5 = 0$

41. $xy' + y' + 3y + x = 0$

42. $y^4 y' + x^2 yy' + xy^2 + \dfrac{1}{x} = 0$

43. $y'' + 4y' + 10y = e^{3x}$

44. $y'' - 6y' + 8y = e^{-5x}$

45. $y'' + 2y' + y = \sin 2x$

46. $y' + y \tan x = \sec x$

47. $ye^{x^2} y' + \dfrac{y'}{y} + xy^2 e^{x^2} + 2x^3 = 0$

48. $y'' - 2y' + 3y = 2x$

49. $y'' - 4y' + 4y = e^{-3x}$

50. $e^{x^2} y' + xy^2 + 2x = 0$

51. $3e^{3x} \cos 2y + \tan 2x - 2y' e^{3x} \sin 2y = 0$

52. $yy' + 4xyy' - y^2 - 1 = 0$

53. $xy' - 5y - x^2 = 0$

54. $y'' - 6y' + 8y = xe^{2x}$