

Problem Set 5: Solution of Second Order Linear ODEs with CC

Find the general solution of the following second-order linear homogeneous differential equations.

1. $y'' - 16y = 0$.

2. $y'' + 2y' = 0$.

3. $y'' + 2y' - 3y = 0$.

29. $y'' - 8y' + 16y = 0$.

30. $8y'' - 2y' - y = 0$.

31. $y'' + 6y' + 9y = 0$.

32. $y'' + 2y' + (\omega^2 + 1)y = 0$.

33. $y'' - 6y' + 18y = 0$.

34. $y'' - 8y' + 15y = 0$.

35. $y'' - 2y' + 5y = 0$.

36. $y'' - 2\pi y' + \pi^2 y = 0$.

37. $y'' + 4y' + 5y = 0$.

38. $y'' + 2y' + y = 0$.

39. $y'' - 8y' + 16y = 0$.

40. $y'' - 2\alpha y' + (\alpha^2 + \beta^2)y = 0$.

Solve the following initial value problems.

41. $y'' + y' - 12y = 0$, $y(0) = 2$, $y'(0) = -1$.

42. $y'' + 3y' = 0$, $y(0) = 3$, $y'(0) = 6$.

43. $y'' + y' - 2y = 0$, $y(0) = 0$, $y'(0) = 6$.

44. $y'' - 4y' + 4y = 0$, $y(0) = 3$, $y'(0) = 5$.

45. $y'' + 2y' + 2y = 0$, $y(0) = 0$, $y'(0) = 1$.

Solve the following boundary value problems.

46. $y'' + 16y' = 0$, $y(0) = 0$, $y(\pi) = -1$.

47. $y'' - 3y' + 2y = 0$, $y(0) = 1$, $y(1) = e$.

48. $y'' - 4y = 0$, $y(-3) = y(3) = \cosh 6$.

49. $y'' - 2y' + 2y = 0$, $y(0) = 2$, $y\left(\frac{\pi}{2}\right) = 0$.

50. $y'' + 2y' = 0$, $y(0) = -1$, $y'\left(-\frac{1}{2}\right) = e - 2$.

Find the general solution of the following homogeneous linear differential equations of order 3 or above

51. $(D^3 - 7D - 6)y = 0$.

52. $(D^3 + 6D^2 + 11D + 6)y = 0$.

53. $(D^3 - 3D^2 + 2D)y = 0$.

54. $(D^3 - D)y = 0$.

55. $(D^3 - 2D^2 - D + 2)y = 0$.

56. $(D^3 - 4D)y = 0$.

57. $(D^4 - 2D^3 - D^2 + 2D)y = 0$.

58. $(D^4 + 3D^3 - D^2 - 3D)y = 0$.

59. $(D^3 - 3D + 2)y = 0$.

60. $(D^3 + 5D^2 + 3D - 9)y = 0$.

61. $(D^3 - D^2 - D + D)y = 0$.

62. $(D^4 + 2D^3 - 2D^2 - 1)y = 0$.

63. $(D^4 - 4D^3 + 6D^2 - 4D + 1)y = 0$.

64. $(D^5 - 4D^4 + D^3 + 10D^2 - 4D - 8)y = 0$.

65. $[D^4 + (m^2 + n^2)D^2 + m^2n^2]y = 0$.

66. $(D^5 - 3D^4 + 5D^3 - 5D^2 + 4D - 2)y = 0$.

67. $(D^6 - 64)y = 0$.

68. $(D^4 + 2D^2 + 1)y = 0$.