

## TWK2A

### Homogeneous linear DEs with constant coefficients (Section 4.3)

### Problems

1. Find the general solution of  $y'' - 4y' + 5y = 0$ .
2. Find the general solution of  $y^{(4)} - 2y'' + y = 0$ .
3. Find the general solution of  $16y^{(4)} + 24y'' + 9y = 0$ .
4. Solve  $y'' + y' + 2y = 0$  with  $y(0) = y'(0) = 0$ .
5. Solve  $y'' - 2y' + 2y = 0$  with  $y(0) = 1, y(\frac{\pi}{2}) = 1$ .
6. Two roots of a cubic auxiliary equation with real coefficients are  $m_1 = -\frac{1}{2}$  and  $m_2 = 3 + i$ . What is the corresponding homogeneous linear DE?
7. Find the general solution of  $y'' - 3y' + 2y = 0$ .
8. Find the general solution of  $y'' - 10y' + 25y = 0$ .
9. Find the general solution of  $2y'' - 3y' + 4y = 0$ .
10. Find the general solution of  $y''' - 6y'' + 12y' - 8y = 0$ .
11. Find the general solution of
$$2\frac{d^5x}{ds^5} - 7\frac{d^4x}{ds^4} + 12\frac{d^3x}{ds^3} + 8\frac{d^2x}{ds^2} = 0.$$
12. Solve  $4y'' - 4y' - 3y = 0$  with  $y(0) = 1, y'(0) = 5$ .
13. Solve  $y'' + 4y = 0$  with  $y(0) = 0, y(\frac{\pi}{4}) = 1$ .
14. Find the general solution of  $y'' + 4y' - y = 0$ .
15. Find the general solution of  $3y'' + y = 0$ .
16. Find the general solution of  $2y'' - 3y' + 4y = 0$ .

17. Find the general solution of

$$\frac{d^3x}{dt^3} - \frac{d^2x}{dt^2} - 4x = 0.$$

18. Find the general solution of  $y^{(4)} - 7y'' - 18y = 0$ .

19. Solve  $y'' - 2y' + y = 0$  with  $y(0) = 5, y'(0) = 10$ .

20. Solve  $y'' - 2y' + 2y = 0$  with  $y(0) = 1, y(\pi) = 1$ .

21. Find the general solution of  $y^{(4)} + y''' + y'' = 0$ .

22. The roots of a cubic auxiliary equation with real coefficients are  $m_1 = 4$  and  $m_2 = m_3 = -5$ . What is the corresponding homogeneous linear DE? Is your answer unique?

23. Find the general solution of  $y''' + 6y'' + y' - 34y = 0$  if it is known that  $y_1 = e^{-4x} \cos x$  is a solution.

24. Solve  $y''' - y = 0$ .

25. Solve  $y^{(5)} + 2y^{(4)} + 6y''' + 12y'' + 9y' + 18y = 0$ .