

Part 1: Homogeneous Linear ODEs with Constant Coefficients (2)

Find the general solution for the following differential equations:

1. $y'' - 4y' + 5y = 0$.
2. $3y'' + 2y' + y = 0$.
3. $y'' - 4y = 0$.
4. $y'' + 4y = 0$.

Solve the IVP:

5. $y'' + y = 0$; $y(\frac{\pi}{3}) = 0$; $y'(\frac{\pi}{3}) = 2$.

Solve the **BVP**:

6. $y'' - 10y' + 25y = 0$; $y(0) = 1$; $y(1) = 0$.
7. $y'' + 4y = 0$; $y(0) = 0$; $y(\pi) = 0$.

Part 2: Method of Undetermined Coefficients

Find the general solution for the following differential equations:

1. $y'' + 3y' + 2y = 6$.
2. $y'' + 4y = 3 \sin(2x)$.
3. $y'' + 2y' + y = \sin x + 3 \cos(2x)$.
4. $y'' - 10y' + 25y = 30x + 3$.
5. $y'' - y' = -3$.
6. $\frac{1}{4}y'' + y' + y = x^2 - 2x$.
7. $y'' + 3y = -48x^2 e^{3x}$.
8. $y'' + y = 2x \sin x$.
9. $y'' - y' + \frac{1}{4}y = 3 + e^{x/2}$.
10. $y'' - 2y' + 5y = e^x \cos(2x)$.
11. $y''' - 6y'' = 3 - \cos x$.
12. $y'' + y = 8 \sin^2 x$.

(You may need to use a certain double-angle trigonometric identity for number 12.)

A few IVPs and BVPs:

13. $y'' + 4y = -2$; $y(\pi/8) = 1/2$, $y'(\pi/8) = 2$.
14. $5y'' + y' = -6x$; $y(0) = 0$, $y'(0) = -10$.
15. $y'' + y = x^2 + 1$; $y(0) = 5$, $y(1) = 0$.