PW/TP 5-6: Linear Differential Equations - Constant coefficients (CH3)

Exercises

Exercise 1. Solve

1. $y'' + 8y' + 12y = 0$
2. $(D^2 + 25)y = 0;\ y(0) = 2;\ y'(0) = -5$
3. $y'' + 4y' + 4y = 0$

Exercise 2. Solve

1. $y'' - 5y' + 6y = 50\sin 4x$
2. $y'' + 3y' + 2y = 4e^{-2x}$
3. $(D^3 + 3D^2)y = 180x^3 + 24x$

Exercise 3. Solve $y'' + 2y' - 3y = xe^{-x}$ using variation of parameters.

Exercise 4. Evaluate the following:

1. $\dfrac{1}{D^2 + D - 12}\{9e^{5x} - 4e^{-x}\}$

2. $\dfrac{1}{(D+1)^2}\{4\sin 2x + 3\cos 2x\}$

3. $\dfrac{1}{(D-4)^5}\{xe^{4x}\}$

4. $\dfrac{1}{D^2 - 4}\{16x^3\}$

Exercise 5. Solve

1. $(D^3 + 8)y = 0$
2. $(D + 6)^4(D - 3)^2 y = 0$
3. $D^4(D + 1)^2(D^2 + 4D + 5)^2(D^2 + 4)y = 0$

Exercise 6. Solve $(D^6 - 2D^5 + D^4)y = 120x + 8e^x$

Exercise 7. Solve using variation of parameters:

1. $y'' + 4y = \csc 2x$
2. $(D^3 + D)y = 4\tan x$

Exercise 8. Evaluate the following:

1. $\dfrac{1}{D+3}\{e^{-2x}\}$

2. $\dfrac{D-1}{D^4+D^2+1}\{8\cos x\}$

3. $\dfrac{1}{D^2+D-2}\{x^2 e^{2x}\}$

4. $\dfrac{1}{D^2-1}\{e^x(\sin x+\cos x)\}$

5. $\dfrac{1}{(D-4)(D+3)(D+1)}\{e^{-2x}\cos 2x\}$

Exercise 9. Solve $(D^2+4D+4)y = 18e^x - 8\sin 2x$ using the operator technique