Problem Set 6
Non-homogeneous equations

Math 51 Fall 2021

due Monday 2022-02-28 at 11:59 PM

These problems relate to material of (Nitecki and Guterman 1992, sec. 2.7 and 2.8).

Reminders

- no practicums this week (Thursday 2022-02-24, Friday 2022-02-25).

Reading for the Week of 2022-02-22

- §2.7: Non-homogeneous equations: undetermined coefficients
- §2.8: Non-homogeneous equations: variation of parameters

Problems

1. Find the constant-coefficient linear operator $A(D)$ of smallest order for which

$$A(D)[te^{-t}\cos(2t) + 2e^{3t}] = 0.$$

2. Make a simplified guess for a particular solution to the ODE

$$(D-1)^2(D^2+1)x = te^{3t} + e^t - \sin(t).$$

   Note: In this problem, you aren't asked to solve for the coefficients.

3. Find the general solution to the ODE

$$(D^3 - D^2 - 2D)x = 1 + e^{2t}.$$

4. Solve the initial value problem:

$$(D^2 - 9)x = 9 + 12e^{-3t}; \quad x(0) = x'(0) = 0.$$

5. Find the general solution to

$$x'' - 2x' + x = e^t \ln(t), \quad t > 0.$$

   (You should use variation of parameters)

Bibliography

Nitecki, Zbigniew, and Martin Guterman. 1992. Differential Equations: A First Course. Saunders.