

Problems Day 15, M 2/26/2024

Topic 7: Polynomial input

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Problem 1. Find a particular solution to $2x'' + 3x' + 4x = 5t$.

Problem 2. What solution would you guess for the following. (Do not solve.)

(a) $2x''' + 3x'' + 4x' + 5x = 2t^2 + 3t + 4$

(b) $x'' + t^2x' + 2x = e^{2t}$ (Trick question!)

Problem 3. Find the general solution to each of the following.

(a) $(D - 3I)(D - 4I)(D - 5I)x = e^{2t}$

(b) $(D - 3I)(D - 4I)(D - 5I)x = \cos(\omega t)$.

Problem 4. Let $T_1f = f'$, $T_2f = f^2$.

(a) Apply T_1T_2 to a test function f .

(b) Apply T_2T_1 to a test function f .

(c) Do T_1 and T_2 commute.

Problem 5. How many solutions does each IVP have?

(a) $x'' + t^2x' + 7x = e^{2t}$, $x(0) = 2$, $x'(0) = 3$.

(b) $x'' + \frac{1}{t^2}x' + 7x = e^{3t}$, $x(0) = 2$, $x'(0) = 3$.

Problem 6. Find a particular solution to $2x'' + 3x' = 5t$.

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