Problems Day 14, F 2/23/2024

Topic 6: Linearity of $P(D)$ and superposition (day 2)

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Problem 1. Let $P(r) = r^2 + 4r + 3$

(a) Compute $P(D)e^{2t}$

(b) Solve $P(D)x = e^{2t}$ by guessing a solution of the form $x = ce^{2t}$.

(c) Solve $P(D)x = e^{2t}$ by applying the ERF.

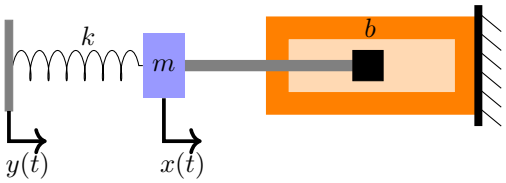
(d) Solve $P(D)x = e^{-3t}$ using the extended ERF.

Problem 2.

(a) Solve $x'' + 2x' + 4x = \cos(3t)$ using the SRF.

(b) Solve $x'' + 2x' + 4x = e^{-3t}\cos(2t)$ using complexification.

Problem 3. A spring-mass-dashpot is driven by pushing on the spring. Suppose the input $y(t)$ gives the position of the end of the spring. Find a DE modeling the displacement $x(t)$ of the mass from equilibrium.



ES.1803 Differential Equations

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