Problems Day 13, R 2/22/2024
Topic 6: Operators, inhomogeneous DEs, ERF, SRF
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Problem 1. Let $P(r) = r^2 + 8r + 7$.

(a) Compute $P(D)t^3$, i.e., "$P(D)$ applied to t^3".

(b) Compute $P(D)e^{rt}$.

(c) Write $P(D)x = 0$ out the long way. What is the characteristic equation?

Problem 2.

(a) Show that $D^2 + 5D = \dfrac{d^2}{dt^2} + 5\dfrac{d}{dt}$ is a linear operator.

(b) Show that T, defined by $Tf = f^2$ is not linear.

Problem 3. Solve $x'' + 8x' + 7x = e^{2t}$ by guessing a solution of the form $x = ce^{2t}$.

Problem 4.

(a) Use complex replacement to compute $D^3(e^t \cos t)$.

(b) Make use of your work in Part (a) to compute $D^3(e^t \sin t)$.

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ES.1803 Differential Equations

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