MATH-332: Linear Algebra Chapter: 5

Eigenvalues and Eigenvectors

Section 5.5: Applications to Differential Equations

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Lecture: Applications to Differential Equations

Topics:	Systems of Linear Ordinary Differential Equations Matrix Exponentiation Decoupling & Diagonalization & Change of Variables
Problems	Prac: 1, 2 Prob: 3, 5, 9

Section Goals

- Understand n^{th} order constant-linear ODE's can be solved using eigenvalues and eigenvectors.

Section Objectives

- Starting with an n^{th} order linear ODE, derive a system of n-many first order equation of n-variables, which reformulates the linear ODE as a matrix ODE.
- Show that the general solution of a constant linear system can be expressed using a matrix exponential.
- Using the matrix exponential formalism show that the general solution to the system can be expressed in the eigenbasis using a linear combination of eigenvectors and eigenfunctions.
- Using diagonalization techniques show how the system decouples when transformed to the eigenvector basis.