Math 107 Lecture 21

Eigenvalues and Eigenvectors Continued

by Dr. Kurianski
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» Announcements

Announcements

- Skill Check 6 is this Wed (11/20, 110 mins)
- Solutions to Homeworks 1-11 *available* in Canvas Modules
- Skill Check 2-5 solution videos *available*
- Assignments Due Friday (11/22):
  - HW12 Handwritten Questions
  - HW12 Coding Problems
  - HW12 MATLAB File Upload
- SOQs
- Asynchronous class on Monday (11/25). Office hours virtual.

Objectives

- Explore properties of eigenvalues and eigenvectors
- Practice computing eigenvalues and eigenvectors

» Student Opinion Questionnaires

- **Anonymous surveys** that are used by the department and university to evaluate instructor performance.
- Share your experience in this course with the department and university.
- Access SOQs in your **CSUF Student Portal** (**`https://my.fullerton.edu/`**).
- Available from Nov. 9 until **Friday, Nov. 29, 2024**.
- More info on Canvas

» Properties of Eigenvalues and Eigenvectors

Let A be an $n \times n$ invertible matrix. The following are true:

1. If A is triangular, then the diagonal elements of A are the eigenvalues of A.
2. If λ is an eigenvalue of A with eigenvector $\vec{v}$ then $\frac{1}{\lambda}$ is an eigenvalue of A^{-1} with eigenvector $\vec{v}$.
3. If λ is an eigenvalue of A then λ is an eigenvalue of A^T.
4. The sum of the eigenvalues of A is equal to the trace of A (sum of the diagonal elements)
5. The product of the eigenvalues of A is equal to $\det(A)$

» Invertible Matrix Theorem

Theorem: Let A be an $n \times n$ matrix. The following statements are equivalent.

- A is invertible.
- The reduced row echelon form of A is I.
- The equation $A\vec{x} = \vec{b}$ has exactly one solution for every $n \times 1$ vector $\vec{b}$.
- The equation $A\vec{x} = \vec{0}$ has exactly one solution (namely, $\vec{x} = \vec{0}$).
- $\det(A) \neq 0$
- **A does not have an eigenvalue of 0**