Math235 Notes

mzx!

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Chapter 1

Eigenvectors and Diagonalization

1.1 Similar Matrices

Introducing Jennifer. She has her own language to represent any vector
In her language, $\{\begin{bmatrix}1\\0\end{bmatrix},\begin{bmatrix}0\\1\end{bmatrix}\}$ equals $\{\begin{bmatrix}3\\2\end{bmatrix},\begin{bmatrix}1\\-1\end{bmatrix}\}$ in OUR Co-ordination System

- Let $\mathbb{B}$ be the basis of **Jennifer's** Co-ordination System
- Let L be the linear-transformation from **Jennifer's** Co-ordination System to **MY** Co-ordination System.
- Let **Matrix A** be the standard Linear-Transformation of L $A = [L]$,in this case, $A = \begin{vmatrix}3 & 1\\2 & -1\end{vmatrix}$
- $[\vec{x}]_{\mathbb{B}}$ represent how **Jennifer** represent $\boxed{\vec{x} \text{ from } \textbf{MY} \text{ Co-ordination System}}$ using her language
- Since we have P, $\boxed{\vec{x} \text{ in Jennifer's language}}$ (i.e. $[\vec{x}]_{\mathbb{B}}$) multiple by P is $\vec{x}$ in Our System $\boxed{P[\vec{x}]_{\mathbb{B}} = \vec{x}}$
- Inverse, $[\vec{x}]_{\mathbb{B}} = P^{-1}\vec{x}$,$(P^{-1})$ convert any vector in out language into Jennifer's language
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Chapter 2

Applications of Orthogonal Matrices

2.1 Orthogonal Similarity

2.1.1 Application

- Find one of the real eigenvalues $C(\lambda) = \det(A - \lambda I) = 0$
- Find the corresponding eigenvector($\vec{v}_1$) $A - \lambda I \rightarrow RREF$
- Extend $\vec{v}_1$ to orthonormal basis of R^n, Usually I, but not always
- Calculate $P_1^T A P_1 = \begin{vmatrix} \lambda & \vec{b}^T \\ \vec{0} & A_1 \end{vmatrix}$
- Inductively working on A_1,Notices that $\begin{vmatrix} \lambda & \vec{b}^T \\ \vec{0} & A_1 \end{vmatrix}$ is already upper triangular
- We are looking for Orthogonal Matrix Q such that $Q^T A_1 Q = T_1$