# Linear Algebra(1)

Matrices & Vectors

Linear System, Gauss Elimination

Vector Space, Subspace

Determinant of a matrix

Inverse matrix, Cramer's Rule

# Linear Algebra(2)

Orthogonality

Eigenvalues & Eigenvectors

Similarity transformation

Diagonalization

Quadratic form

# Eigenvalues & Eigenvectors

- eigenvalues and eigenvectors
- symmetric, skew-symmetric, and orthgonal matrices
- similar matrices
- similarity transformation
- diagonalizations
- quadratic form

# Similarity transformation

- For a square matrix $A \in R^{n \times n}$, $\hat{A}$ is called similar to $A$ if

$$\hat{A} = PAP^{-1}$$ , for some nonsingular $P$.

- $\hat{A}$ has the same eigenvalues as $A$.

$n$ 개의 선형독립인 고유벡터를 갖는 행렬 $A \in R^{n \times n}$ 에 의한 선형변환

# 서로 다른 $n$ 개의 고유값을 갖는 경우

- If $A \in R^{n \times n}$ has $n$ distinct eigenvalues, then $A$ has $n$ independent eigenvectors.

# 대칭행렬인 경우

- Symmetric matrix has $n$ independent eigenvectors. Moreover, all eigenvectors can be mutually orthogonal.

$$A = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix}$$

$$A = \begin{bmatrix} 0 & 1 \\ -4 & -4 \end{bmatrix}$$

$$A = \begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix}$$

# Diagonalization of a matrix

# Quadratic form

# Example

- $Q = 17x^2 - 30xy + 17y^2 = 128$