

# 1 The content of Algebra 3

## 1. Square Matrices

- Characteristic polynomial
- Eigenvalues and eigenvectors
- On the inverse of a square matrix

## 2. Similar Matrices

## 3. Diagonalizable Matrices

- Necessary and sufficient condition for diagonalization
- The square root of diagonalizable matrices
- Finding the power of square matrices
- Finding the exponential of square matrices
- System of recurrence sequences
- System of linear differential equations

## 4. Matrix Norms: Vector norms, Matrix norms, Inner product or Scalar product

## 5. Special Matrices

- Zero matrix, diagonal matrix, unit matrix or the identity matrix, upper triangular matrix, lower triangular matrix, strictly triangular matrices, ...
- Symmetric matrices, Skew-symmetric matrices, Orthogonal matrices
- Hermitian matrices, skew-Hermitian matrices
- Unitary matrices, Idempotent matrix, Normal matrices, Nilpotent matrices, ...

## 6. Non-Diagonalizable Matrices

- Trigonalizable matrices
- Cayley-Hamilton theorem
- Minimal polynomial
- Nilpotent matrices
- Finding the power of square matrices
- Finding the exponential of square matrices
- System of recurrence sequences
- System of linear differential equations

## 7. Jordan Canonical Form

## 8. The Ring of Polynomials