

# Content of Algebra 3

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### 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