

**UCSB Department of Mathematics**  
**Course Outline**  
**MATH 4A: Linear Algebra**

The following is a typical outline of MATH 4A at UCSB. Instructors will generally cover the content described here, but the pacing and structure of the course may vary.

(Parentheses indicate sections from the suggested textbook, Linear Algebra and Its Applications, 5<sup>th</sup> Ed. by Lay, Lay & McDonald.)

Week 1:

- Solving Linear Systems; Row Reduction (1.1-1.2)
- Echelon Form; Vector Equations (1.2-1.3)
- Matrix Equations (1.4)

Week 2:

- Solution Sets (1.5-1.6)
- Linear Independence (1.7)
- Introduction to Linear Transformations (1.8)

Week 3:

- The Matrix of a Linear Transformation (1.9)
- MIDTERM 1
- Matrix Operations (2.1)

Week 4:

- The Inverse of a Matrix (2.2)
- Characterizations of Invertible Matrices (2.3)
- Subspaces of  $\mathbb{R}^n$  (2.8)

Week 5:

- Introduction to Determinants (3.1)
- Properties of Determinants (3.2)
- Vector Spaces & Subspaces (4.1)

Week 6:

- Null Spaces, Column Spaces, and Linear Transformations (4.2)
- Linearly Independent Sets; Bases (4.3)
- Coordinate Systems (4.4)

Week 7:

- Dimension of a Vector Space (4.5)
- Rank (4.6)
- MIDTERM 2

Week 8:

- Eigenvalues & Eigenvectors (5.1)
- The Characteristic Equation (5.2)
- Diagonalization (5.3)

Week 9:

- Eigenvectors & Linear Transformations (5.4)
- Complex Eigenvalues (5.5)
- Discrete Dynamical Systems (5.6)

Week 10:

- Inner Product, Length, & Orthogonality (6.1)
- Orthogonal Sets (6.2)
- Orthogonal Projections (6.3)