

Torrey Pines High School – Linear Algebra

San Diego State University Math 254 – Introduction to Linear Algebra

(3 semester units)

Note: Students in Linear Algebra passed the AP Calculus BC exam or AB exam and completed Calculus C. Students are encouraged to complete Calculus D before or concurrently with Linear Algebra.

Text: *Elementary Linear Algebra*, Howard Anton (8th edition)

Chapter 1 — Systems of Linear Equations and Matrices

- 1.1 Introduction to Systems of Linear Equations
- 1.2 Gaussian Elimination
- 1.3 Matrices and Matrix Operations
- 1.4 Inverses; Rules of Matrix Arithmetic
- 1.5 Elementary Matrices and a Method for Finding A^{-1}
- 1.6 Further Results on Systems of Equations and Invertibility
- 1.7 Diagonal, Triangular, and Symmetric Matrices

Chapter 2 — Determinants

- 2.1 The Determinant Function
- 2.2 Evaluating Determinants by Row Reduction
- 2.3 Properties of the Determinant Function
- 2.4 Cofactor Expansion; Cramer's Rule

Chapter 3 — Vectors in 2-Space and 3-Space

- 3.1 Introduction to Vectors (Geometric)
- 3.2 Norm of a Vector; Vector Arithmetic
- 3.3 Dot Product; Projections
- 3.4 Cross Product
- 3.5 Lines and Planes in 3-Space

Chapter 4 — Euclidean Vector Spaces

- 4.1 Euclidean n -Space
- 4.2 Linear Transformations from R^n to R^m
- 4.3 Properties of Linear Transformations from R^n to R^m

Chapter 5 — General Vector Spaces

- 5.1 Real Vector Spaces
- 5.2 Subspaces
- 5.3 Linear Independence
- 5.4 Basis and Dimension
- 5.5 Row Space, Column Space, and Nullspace
- 5.6 Rank and Nullity

Chapter 6 — Inner Product Spaces

- 6.1 Inner Products
- 6.2 Angle and Orthogonality in Inner Product Spaces
- 6.3 Orthonormal Bases; Gram-Schmidt Process; QR -Decomp.
- 6.5 Orthogonal Matrices; Change of Basis

Chapter 7 — Eigenvalues, Eigenvectors

- 7.1 Eigenvalues and Eigenvectors
- 7.2 Diagonalization
- 7.3 Orthogonal Diagonalization

Chapter 8 — Linear Transformations

- 8.1 General Linear Transformations
- 8.2 Kernel and Range

We may also include some additional topics from Chapters 8, 9, and 10.