

EE16A Supplementary Readings

Anant Sahai and Nikunj Jain

Instructions

These are sample suggested readings and pointers to content in Strang's Linear Algebra, 5th edition and into Schaum's Linear Algebra, 5th edition.

Introductions

1. Introduction to Vectors (Note 1)

Strang

Page 1-6 & Problem Set 1.1 *Extra: Try reading the portions on linear combinations which generate a "space".*

Schaum's

Page 1-3 & Problems 1.1 to 1.6

2. Introduction to Matrices (Note 1)

Strang

Page 22-23

Schaum's

Page 27 - 29, Problem 2.1, 2.2, 2.3, 2.38

3. Systems of Linear Equations

Strang

Page 23-27, Problem Set 1.3 *Extra: Understand what "cyclic" matrices are.*

Schaum's

Page 57 - 64, Problems 3.1 to 3.6, 3.49 to 3.52, 3.72

4. Introduction to Gaussian Elimination

Strang

Page 36-37, 46-51, 58, 60-61, 63-64, 86-90 Problem Set 2.1, 2.2, 2.3 *Extra: Understand the link between free variables and pivots.*

Schaum's

Page 67-78, Problems 3.11 to 3.23, 3.53 to 3.56, 3.61 to 3.64

Vectors and Matrices

1. Matrix-Vector Multiplication

Strang

Page 59, Problem Set 2.3

2. Matrix-Matrix Multiplication

Strang

Page 61-62, Problem Set 2.3

Schaum's

Page 30-33, Problems 2.4 to 2.11, 2.39 to 2.40, 2.42, 2.44 - 2.49, 2.12 to 2.16, 2.41, 2.43, 2.72 *Extra: Understand Polynomials in Matrices.*

Linear Dependence

1. Definitions of Linear Dependence

Strang

Page 164-167 *Infer the ideas of Matrix columns as vectors, and their relations of dependence to the Gaussian Elimination algorithm.*

Schaum's

Page 121-124, Problems 4.17 to 4.22, 4.89 to 4.96

Linear Transformations

1. Definitions

Strang

Page 401 - 407, Problem Set 8.1

Schaum's

Page 167-169 *Extra: Read the concepts of Vector Space Isomorphism.*

2. Matrices as Linear Operators

Schaum's

Page 175 Section "Square Matrices as Linear Operators"

Vector Spaces

1. Introduction

Strang

Page 123 - 125, Problem Set 3.1

Schaum's

Page 112-114, Problems 4.1, 4.2, 4.71 to 4.76 *Extra: Read and Understand Polynomial Spaces, Spaces of Arbitrary "Field"*

2. Subspaces

Strang

Page 125 - 127, Problem Set 3.1
Schaum's
Page 117-119, Problems 4.8 to 4.12, 4.77 to 4.82

3. **Columnspace**

Strang
Page 127 - 129, Problem Set 3.1

4. **Nullspace, Rank**

Strang
Page 135 - 141, Problem Set 3.2

5. **Linear Span**

Schaum's
Page 119-121, Problems 4.13 to 4.16, 4.66, 4.69, 4.83 to 4.88

6. **Basis, Dimensionality**

Strang
Page 167 - 171, Problem Set 3.4 *Extra: Read Sections on Matrix and Function Space*

Schaum's
Page 124-126, 127-129 Problems 4.24 to 4.28, 4.97 to 4.103, 4.33 to 4.40
Extra from Strang: Page 421 - 428, "What makes a good basis?"

Strang - Pages 181-189 Cover "Four Fundamental Subspaces" - these introduce the "fundamental Theorem of Linear Algebra", and talk about all the properties of these spaces. Problem Set 3.5

Matrix Inverse

1. **Introduction and Definitions**

Strang
Page 83 - 85, Problem Set 2.5
Schaum's
Page 33-34, Problems 2.17 to 2.20, 2.54, 2.55, 2.57, 2.58

Incidence Matrices and Graphs

1. **Graphs, Properties of Incidence matrix $ATAx = f$; Networks**

Strang
Page 452 - 454, 454 - 456, 457 - 459 Problem Set 10.1 *Extra: Conceptually understand the equivalence of introducing Kirchoff's laws from matrices*

LU Decomposition

1. Introduction and Efficiency

Strang

Page 97 - 102, page 104 to 108, Problem Set 2.6

Schaum's

Page 87-89, Problems 3.39 to 3.48, 3.69 to 3.71

Determinants

1. Introduction

Strang

Page 247 - 253, page 254 to 257, Problem Set 5.1

Schaum's

Page 264-265, 265-266, Problems 8.1, 8.38, 8.39, 8.2, 8.40 to 8.43

2. Properties of Determinants

Schaum's

Page 268-269, Problems 8.3, 8.4, 8.22 to 8.30, 8.33, 8.67, 8.69

3. The Area (Volume) Interpretation

Strang

Page 276 - 279, page 283 to 287, Problem Set 5.3

Eigenvalues and Eigenvectors

1. Introduction

Strang

Page 288 - 291

Schaum's

Page 296-299

2. Calculating Eigenvalues

Strang

Page 292 - 296, Problem Set 6.1

3. Diagonalization

Strang

Page 304 - 309

Schaum's

Page 299-301, Problems 9.9 to 9.21, 9.45 to 9.51

Orthogonality

1. Introduction to Inner Products

Strang

Page 194 - 197, Problem Set 4.1

Schaum's

Page 226-227, 227-229, 229-230, Problems 7.1 to 7.9, 7.57 to 7.63 *Extra:*
Understand the material on Function / Polynomial / Matrix Spaces.

2. Introduction to Orthogonality, Orthogonal Complements

Strang

Page 194 - 197, 197 - 201

Schaum's

Page 231-232, Problems 7.10 to 7.18, 7.64 to 7.73

3. Introduction to Projections

Strang

Page 206 - 210, 210 - 213, Problem Set 4.2

4. QR Decomposition, Gram-Schmidt

Strang

Page 236 - 240, page 242 to 246, Problem Set 4.4 **There is some confusing notation in this section, where Strang uses capital letters A, B, C to denote orthogonal vectors in some problems, and to denote matrices in others, caution is needed**

Schaum's

Page 235-237, 237-239, Problems 7.19 to 7.31, 7.74 to 7.78, 7.32 to 7.38, 7.79 to 7.82

5. Least Squares

Strang

Page 219 - 229, page 229 to 232, pset 4.3