

CONTENTS

PREFACE ix

1 MATRICES AND SYSTEMS OF EQUATIONS I

- 1 Systems of Linear Equations I
- 2 Row Echelon Form 13
- 3 Matrix Algebra 33
- 4 Elementary Matrices 67
- 5 Partitioned Matrices 79
- MATLAB Exercises 91
- Chapter Test 97

2 DETERMINANTS 99

- 1 The Determinant of a Matrix 99
- 2 Properties of Determinants 107
- 3[†] Cramer's Rule 115
- MATLAB Exercises 121
- Chapter Test 123

3 VECTOR SPACES 125

- 1 Definition and Examples 125
- 2 Subspaces 134
- 3 Linear Independence 144
- 4 Basis and Dimension 156
- 5 Change of Basis 163
- 6 Row Space and Column Space 174
- MATLAB Exercises 184
- Chapter Test 186

- 4 LINEAR TRANSFORMATIONS 188
- 1 Definition and Examples 188
 - 2 Matrix Representations of Linear Transformations 198
 - 3 Similarity 212
 - MATLAB Exercises 220
 - Chapter Test 221
- 5 ORTHOGONALITY 223
- 1 The Scalar Product in R^n 224
 - 2 Orthogonal Subspaces 239
 - 3 Least Squares Problems 249
 - 4 Inner Product Spaces 260
 - 5 Orthonormal Sets 270
 - 6 The Gram–Schmidt Orthogonalization Process 290
 - 7[†] Orthogonal Polynomials 299
 - MATLAB Exercises 307
 - Chapter Test 310
- 6 EIGENVALUES 312
- 1 Eigenvalues and Eigenvectors 313
 - 2 Systems of Linear Differential Equations 326
 - 3 Diagonalization 339
 - 4 Hermitian Matrices 355
 - 5 The Singular Value Decomposition 367
 - 6 Quadratic Forms 382
 - 7 Positive Definite Matrices 397
 - 8[†] Nonnegative Matrices 405
 - MATLAB Exercises 412
 - Chapter Test 421
- 7 NUMERICAL LINEAR ALGEBRA 422
- 1 Floating-Point Numbers 423
 - 2 Gaussian Elimination 427
 - 3 Pivoting Strategies 436
 - 4 Matrix Norms and Condition Numbers 442
 - 5 Orthogonal Transformations 458

6	The Eigenvalue Problem	470
7	Least Squares Problems	482
	MATLAB Exercises	494
	Chapter Test	503

8 ITERATIVE METHODS *Web

9 JORDAN CANONICAL FORM *Web

APPENDIX: MATLAB 505

BIBLIOGRAPHY 517

ANSWERS TO SELECTED EXERCISES 520

INDEX 540

*Web: The Supplemental Chapters 8 and 9 can be downloaded from the web page: (www.prenhall.com/Leon)

†Optional sections.