STUDY GUIDE FOR THE FINAL EXAM
LINEAR ALGEBRA (MATH 115A)

1. CHAPTER 1: VECTOR SPACES

(1) Definition of vector space and examples.
(2) Exercises: Section 1.2: $12 - 15, 18$.
(3) Definition of subspace and Theorem 1.3 for testing subspace.
(4) Exercises: Section 1.3: $8, 10, 11, 17 - 20$.
(5) Definition of span and generating set.
(6) Exercises: Section 1.4: $5, 9, 12, 13$.
(7) Linear dependence and independence.
(8) Theorem 1.7 and its applications.
(9) Exercises: Section 1.5: $2(a) - (f), 9, 13$.
(10) Basis and dimension.
(11) Theorem 1.9, Replacement Theorem (1.10) and Corollary 2 and their applications.
(12) Theorem 1.11 and its Corollary, and their applications.
(13) Exercises: Section 1.6: $4 - 9, 11 - 17, 26$.

2. CHAPTER 2: LINEAR TRANSFORMATION AND MATRICES

(1) Definition of linear transformation, null space $N(T)$, range $R(T)$, nullity and rank.
(2) Theorem $2.3, 2.4, 2.5, 2.6$ and their applications.
(3) Exercises: Section 2.1: $2 - 6, 9 - 14, 17$.
(4) Ordered basis, coordinate vector and matrix representation.
(5) Exercises: Section 2.2: $3 - 5$.
(6) Invertible linear transformation and isomorphism. A linear transformation is invertible if and only if it is *one-to-one* and *onto*.
(7) Theorem 2.18 and 2.19 and their applications.
(8) Exercises: Section 2.4: $2, 3, 14, 15, 17, 22$.
(9) Change of coordinate matrix, Theorem 2.23 and its applications.
(10) Exercises: Section 2.5: $3 - 5$.

3. Chapter 5: Diagonalization

(1) Definition of diagonalizibility, characteristic polynomial, eigenvalue and eigenvector, Theorem 5.1.
(2) Exercises: Section 5.1: $2, 3, 8(a) - (b), 8 - 11, 15$.
(3) Theorem 5.9, test for diagonalization and applications.
(4) Exercises: Section 5.2: $2, 3, 8$.

4. Chapter 6: Inner Product Space

(1) Definition of inner product, norm of a vector and their examples.
(2) Exercises: Section 6.1: $2 - 5, 8, 9$.
(3) Definition of orthogonal set and orthonormal set of vectors and their examples.
(4) Orthonormal basis, Theorem 6.3, Corollary 2 and their applications.
(5) Gram-Schmidt Process (Theorem 6.4) and its applications.
(6) Exercises: Section 6.2: $2, 4 - 8, 17$.