Math 327
Exam 5 Review Sheet

Section 4.9: The Rank of a Matrix

• know the definition of the row space of a matrix and the column space of a matrix.
• Know the definition of the row rank, column rank, and rank of a matrix and be able to find these ranks for a given matrix.
• Be able to find a basis for the row (column) space of a given matrix consisting of original rows (columns).
• Be able to find a basis for the row (column) space of a given matrix **not** consisting of original rows (columns)
• Be able to use the determinant of a square matrix to determine whether or not it has full rank.
• Know the definition of the nullity of a matrix, and be able to find the nullity of a given matrix as well as a basis for the null space.
• Know the statements of Theorem 4.18, 4.19, 4.20, and corollaries 4.7, 4.8, 4.9, and 4.10.
• Know the 10 equivalent statements about *ntimesn* matrices listed on p. 281 in your textbook.

Sections 6.1: Linear Transformations

• Know the definition of a linear transformation and a linear operator.
• Be able to determine whether or not a given function is a linear transformation.
• Be able to give a geometric description of a linear transformations defined on two and three dimensional vectors.
• Know both the statement and proof of both Theorem 6.1 and Theorem 6.2
• Know the statement of Theorem 6.3 and the definition of the standard matrix representing a linear transformation L.

Section 6.2: The Kernel and Range of a Linear Transformation

• Know the definition of a one-to-one function and the definition of an onto function.
• Be able to determine whether or not a given linear transformation is 1-1 and whether or not it is onto.
• Know the definitions of the kernel of a linear transformation and the range of a linear transformation.
• Be able to use set notation to describe the kernel of a linear transformation or the range of a linear transformation.
• Be able to find a basis for the kernel of a linear transformation or the range of a linear transformation.
• Be able to find the dimension or the kernel (the nullity) of a linear transformation or the dimension of the range of a linear transformation.
• Know the definition of an invertible linear transformation and be able to check whether or not two given linear transformations are inverses of each other.
• Know the statement and proof of Theorem 6.4
• Know the statements of Corollaries 6.1 and 6.2 and the statements of Theorem 6.6, 6.7, and 6.8
• Know the 10 equivalent statements about *ntimesn* matrices and the 3 equivalent statements about linear transformations listed on p. 387 in your textbook.

Section 7.1: Eigenvalues and Eigenvectors

• Know the definition of an eigenvalue of a linear transformation and the definition of an eigenvalue of a matrix.
• Know the definition of an eigenvector associated with a given eigenvalue.
• Be able to find the characteristic polynomial of a given matrix.
• Be able to find the eigenvalues of a given linear transformation using algebra. Also be able to find the eigenvalues of a given matrix using the characteristic polynomial.
• Be able to find the eigenvectors associated to a given eigenvalue. Also be able to find the associated eigenspace.
• Know the statement of Theorem 7.1