Fall 2019 Linear Algebra Test #2 Study Guide
Dr. Day's section 002

The test covers Chapters 3 and 4 of the book. You need to be able to do the following:

- Check whether a subset of a vector space is a subspace or not.
- Check whether a vector is in the span of a set of vectors.
- Check whether a set of vectors spans a given vector space.
- Check whether a set of vectors is linearly independent.
- Determine the dimension of a vector space (or subspace).
- Find the coordinates of a vector with respect to a given ordered basis.
- Find the transition matrix between two ordered bases for the same vector space.
- Find a basis for the nullspace of a matrix.
- Find a basis for the row space of a matrix.
- Find a basis for the column space of a matrix.
- Check whether a function is linear.
- Find the matrix representation of a linear function with respect to a pair of bases.

You should review the definitions and theorem statements in Chapters 3 and 4. They may come up in the True/False section of the test. Important concepts to review include:

- The definition of vector space. You do not need to memorize the definition, but be familiar with it. See p. 115.
- Examples of vector spaces, including $\mathbf{R}^n$, $\mathbf{R}^{n\text{x}m}$, P_n, and $C[a,b]$. See Section 3.1.
- The characterization of subspaces as subsets that are closed under addition and scalar multiplication. The book calls this the definition. See p. 120.
- The definition of the nullspace of a matrix. See p. 122.
- The definition of the span of a set. See p. 123.
- The definition of linear independence. See p. 132.
- The definition of basis. See p. 141.
- The definition of dimension of a vector space. See p. 143.
- Theorems about dimension, linear independence, and spanning sets. See Section 3.4 and the notes on the website.
- The definitions of coordinates and transition matrices. See p. 153.
- The definitions of the row and column spaces of a matrix, and the rank of a matrix. See p. 157.
- Theorems about row and column spaces, including the Rank-Nullity Theorem and the fact that the rank can be computed using either the row space or the column space. See Section 3.6.
- The definition of linear. See p. 169-170.
- The Matrix Representation Theorem. See p. 182, and the more restrictive version on p. 179.

You do not need to know anything from chapter 5 for this test! You also don't need to know about the Wronskian. Ideas from Chapters 1 and 2 may come up, but they are not the focus of the test.

Good luck!