<u>Math 544, Final Exam Information</u>

The Final Exam will be based on:

- Sections 1.1 - 1.3, 1.5 - 1.7, 1.9, 3.2 - 3.7, 4.1 - 4.5, 4.7, 5.2 - 5.5.
- The corresponding assigned homework problems (see http://www.math.sc.edu/∼boylan/SCCourses/math5442/544.html). **At minimum, you need to understand how to do the homework problems.**
- Lecture notes: 1/17 - 4/27.

Useful materials:

- Exams 1, 2, 3 and their solutions.
- Quizzes $1 - 10$ and their solutions.
- Handouts: Selected homework problems, and other handouts.

New Topic List (not necessarily comprehensive):

(Consult review handouts for Exams I, II, III for a list of old topics.)

You will need to know how to define vocabulary words/phrases defined in class.

§**5.2**: **Vector spaces:** The definition of vector space (a set V and a scalar field F together with an addition operation on V and a scalar multiplication operation); in particular, the ten vector space axioms: 2 closure axioms, 4 axioms for vector addition, 4 axioms for scalar multiplication. Examples of vector spaces: $\text{Mat}_{m\times n}(\mathbb{R})$, P_n. Check whether a set V together with an addition and scalar multiplication is or is not a vector space.

§**5.3**: **Subspaces:** Definition of a subspace. Determine whether a subset W of a vector space V is a subspace: (1) is the "zero" vector in V also in W? (2) For any $\vec{\mathbf{u}}, \vec{\mathbf{v}} \in W$, and any scalar c, is $c\vec{\mathbf{u}} + \vec{\mathbf{v}} \in W$? If W is a subspace, a subset Q **spans** W if and only if $\text{Span}(Q) = W$, where $\text{Span}(Q)$ is the set of all linear combinations of vectors from Q. Given a subpace W, find a subset Q which spans it.

§**5.4**: **Linear independence, bases, and coordinates:** Definition of linear dependence / independence, basis of a vector space V, ordered basis for a vector space V, coordinates of a vector $\vec{\mathbf{v}} \in V$ relative to an ordered basis B for V.

Given a subset of vectors $Q \subset W$, determine whether Q is linearly independent. Given a subspace W of a vector space V, determine a basis for W. Given a basis B for a vector space V and a vector $\vec{\mathbf{v}} \in V$, determine $(\vec{\mathbf{v}})_B$, the coordinates of $\vec{\mathbf{v}}$ relative to the basis B.

§**5.5**: **Dimension:** Definition and computation of the dimension of a subspace W of a vector space V.