Topics for Math 227's Exam 1

The first exam will cover sections 1.1 - 1.5, 1.7 - 1.9, 2.1, and 2.2. Anything which we have discussed in class or occurs in those sections is fair game. The format of the exam will be similar to that of the quizzes (although longer, of course), so studying those is a good place to start.

Here are some of the terms and concepts you should be familiar with:

- Systems of linear equations;
- Solution sets;
- The coefficient matrix and augmented matrix;
- Echelon form and reduced echelon form;
- Pivot positions/columns;
- Vector equations;
- Scalars, weights;
- Matrix equations ($A\mathbf{x} = \mathbf{b}$);
- Homogeneous systems;
- Trivial and nontrivial solutions;
- Linear combinations, Span;
- $\mathbb{R}^n$;
- Linear independence/dependence;
- Linear dependence relations;
- Linear transformations;
- One-to-one, Onto;
- Matrices (and their descriptions);
- The zero vector and zero matrix;
- The identity matrix; The vectors $\mathbf{e}_i$;
- Inverses of matrices.

Here are some of the things you should be able to do:

- Solve a system of linear equations. Give a parametric description of the solution set and express the solution set in parametric vector form. Also, give a geometric description of a solution set (as a line or plane, for instance).
- Determine whether a homogeneous system has a non-trivial solution, relate that solution to the solution set of a corresponding nonhomogeneous system.
- Row reduce matrices.
- Identify a matrix as being in echelon or reduced echelon form.
- Perform arithmetic with vectors.
- Determine whether a given vector is a linear combination of other vectors, and if so, express it as such.
- Determine whether vectors (or columns of a matrix) are linearly independent or dependent.
- Find the standard matrix for a linear transformation.
- Determine whether a linear transformation is one-to-one or onto (or both).
- Check whether a given transformation is in fact linear.
- Perform arithmetic with matrices (including multiplication).
- Find the inverse of a matrix if it exists, or show that it does not. (Use both the formula for 2x2 matrices and the row reduction algorithm for larger ones.)
- Use the inverse of a matrix to solve matrix equations (i.e., solve $A\mathbf{x} = \mathbf{b}$ using A^{-1}).
- Answer conceptual questions about linear algebra (as in the true/false questions from the homework).