Math 167 (De Loera) **Homework 2**
Due date: October 27th, 2014

INSTRUCTIONS

This homework has many problems. By presenting solutions of ALL problems you will receive 1point. 2 or 3 problems will be marked for correctness for the remaining 4 points. MATLAB exercises need to be submitted via SMARTSITE using the assignment boxes.

Write legibly preferably using word processing if your hand-writing is unclear. Be organized and use the notation appropriately. Show your work on every problem. Correct answers with no support work will not receive full credit.

1. Read Chapter 3 of Eldén, Read Chapter 2 of Moler's online book.
2. Prove the column rank of A is the same as the row rank of A.
3. Prove that $lim_{p\to\infty}||x||_p = ||x||_\infty$
4. What is the $||D||_p$ of a diagonal matrix?
5. The spectral radius $\rho(A)$ of a square matrix A is the maximum length of an eigenvalue of A. Prove that the matrix norm of A is bounded below by the spectral radius.
6. Solve problems 2.11 in Chapter 2 of Moler's MATLAB book.
7. Solve problems 2.20 in chapter 2 of Moler's MATLAB book.
8. Solve problems 2.21 in chapter 2 of Moler's MATLAB book
9. Define the following matrix (in MATLAB notation) $A = [1\ 2; 0\ 2; 1\ 3]$

   a) compute the 2-norm by the norm function, and see the results in a long format (16 digits) via

   ```
   >> format long
   >> norm(A)
   ```

   (b) Compute the 2-norm explicitly using the largest eigenvalue of AT A using the eig function, i.e.,

   ```
   >> sqrt(max(eig(A*A)))
   ```

   Then, compare the result with that of Part (a). What is the relative error between the norm computed in Part (a) and that in Part (b)?

   (c) Compute the 1-norm, and infinity norm, by hand using the formulas derived in the class. Then, using the norm function, compare the MATLAB outputs with your hand-computed results.