INSTRUCTIONS
This homework has many problems. By presenting solutions of ALL problems you will receive 1 point. 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 handwriting 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.
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) $A = \begin{bmatrix} 1 & 2; 0 & 2; 1 & 3 \end{bmatrix}$
   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.,

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   >> 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.