Homework # 3, due Wed, Feb 9th.

For all problems, turn in your code (and MATLAB diaries when needed).

1. Create a MATLAB function that inputs a matrix $A$, a vector $x^{(0)}$, a tolerance bound $tol$ and uses the power method to obtain an approximate eigenpair $(\lambda, x)$ with the stopping criterion $\|x^{(k)} - x^{(k-1)}\|_\infty < tol$. Run your algorithm with

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}, \quad x^{(0)} = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}, \quad tol = 0.01.$$

2. Create a MATLAB function that inputs a matrix $A$, vectors $b$ and $x^{(0)}$ and a tolerance $tol$ and finds an approximate solution to $Ax = b$ using the Jacobi method.

3. Same as in #2 for the Gauss-Seidel.

4. Same as in #3 for the relaxation method, with an additional input parameter $\omega \in (0, 2)$.

5. For 2-3 systems of your choice, analyze the performance of the algorithms from Problems # 2-4. If you observe differences in convergence, try to explain why that happens.