

## 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.