Homework #4

• Textbook:
  – Due: 8.1.12, 8.2.4, 8.2.12, 8.2.18, 8.2.24
  – Not due: 8.1.14, 8.2.27, 8.2.28

• Programming:

  1. (a) Write a function that takes a input
     – dimension $n$ and number of steps $N$;
     – $n \times n$ matrix $A$;
     – $n \times 1$ vectors $b$ and $x_0$;
     uses Jacobi method, solving $Ax = b$, to calculate $x_N$ from initial guess $x_0$, and outputs the number of flops used. Write out or print out your function and turn it in.

     (b) Let $A = (a_{ij})$, where
         $$a_{ij} = \begin{cases} 
         1, & \text{if } i \neq j \\
         n, & \text{if } i = j 
         \end{cases}$$
         and let $b$ be the vector of all 1’s and $x_0$ the vector of all 0’s. Run your function for the cases $n = 10, N = 10$ and $n = 100, N = 10$ and $n = 200, N = 10$, and write out or print out your output.

  2. (Not due)

     (a) Using the coordinate list sparse matrix format, write a function that inputs
     – number of steps $N$;
     – $n, m, r, c, v$ of a sparse matrix $A$, with $r$ in non-decreasing order;
     – $n \times 1$ vectors $b$ and $x_0$;
     uses Jacobi method, solving $Ax = b$, to calculate $x_N$ from initial guess $x_0$, and outputs the number of flops used. Write out or print out your function and turn it in.

     (b) Let $A$ be the tridiagonal matrix with 2’s on the main diagonal and $-1$’s in the upper and lower diagonals, and let $b$ be the vector of all 1’s, and $x_0$ the vector of all 0’s. Run your function for the cases $n = 5, N = 10$ and $n = 10, N = 10$ and $n = 20, N = 10$, and write out or print out your output.