Homework #4

- Textbook:
  - Due: 8.1.12, 8.2.4, 8.2.12, 8.2.18
  - Not due: 8.1.14, 8.2.24, 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 sparse matrix format in HW #2’s programming assignment, 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.