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.