Math 3620 Machine Problem 4: Due Tu. Feb. 4, 2020

1) Write a function `[x,nit] = jacobi(A,b,eps,maxit,pr)` to carry out the Jacobi method for solving a linear system $Ax = b$.

   a) The input should be A and b, along with parameters `eps` and `maxit` to control the iteration and a parameter `pr` to control printing inside the function. The output should be the final value of your approximation to x and the number `nit` of iterations used.
   b) Before starting the iteration, scale the equations by dividing both sides of the i-th equation by A_{ii}.
   c) The iteration should start with an initial vector of all ones.
   d) It should perform at most `maxit` iterations
   e) The iteration should stop when the maximum norm of the difference between two successive iterates is less than `eps`. If `pr` $= 1$, print these norms (to 10 digits at least) for each step of the iteration.

2) Write a similar function `[x,nit] = gausseidel(A,b,eps,maxit,pr)` to carry out the Gauss-Seidel method for solving $Ax = b$.

3) Write a main program which does the following:

   a) Reads n, A, b from a file and sets `eps`, `maxit`, and `pr`.
   b) Calls `jacobi` and once it stops prints the final approximation for x and the maximum norm of the corresponding residual – use format long.
   c) Repeats 3b with `gausseidel`.

4) Run your program on the system given in the file mp4.dat1 with `eps` = 1e-6, `maxit = 20`, and `pr` $= 1$.

5) Write a second driver program which prompts for an integer n, then sets up a $n \times n$ **sparse** tridiagonal matrix A with 5's on the diagonal, and -1's on the super and sub diagonals. Set b to be a vector of n ones. Run this program with the same `eps`, `maxit`, but with `pr` $= 0$ (in other words no prints inside your functions).

6) Turn in a complete listing of your code along with the output for all runs.