AMSC/CMSC 460: HW #4
Due: Thursday 2/23/16 (in class)

Please submit the solution to at least one problem in LaTeX.

All problems this week should be solved by hand without Matlab.

1. Show that every matrix of the form
$$A = \begin{pmatrix} 0 & 0 \\ a & b \end{pmatrix}$$
has an LU factorization. Does it have a Doolittle factorization?

2. Find a Cholesky factorization of
$$A = \begin{pmatrix} 4 & 1/2 & 1 \\ 1/2 & 17/16 & 1/4 \\ 1 & 1/4 & 33/64 \end{pmatrix}$$

3. Determine the LU factorization of
$$A = \begin{pmatrix} 3 & 0 & 1 \\ 0 & -1 & 3 \\ 1 & 3 & 0 \end{pmatrix}$$
in which L is a lower triangular matrix with twos on its main diagonal

4. If A has a Doolittle factorization, what is a simple formula for the determinant of A?

5. Show how Gaussian elimination with scaled row pivoting works on the system $Ax = b$ with

   (a)
$$A = \begin{pmatrix} -1 & 1 & -4 \\ 2 & 2 & 0 \\ 3 & 3 & 2 \end{pmatrix}, \qquad b = \begin{pmatrix} 0 \\ 1 \\ 1/2 \end{pmatrix}$$

   (b)
$$A = \begin{pmatrix} -1 & 1 & 0 & -3 \\ 1 & 0 & 3 & 1 \\ 0 & 1 & -1 & -1 \\ 3 & 0 & 1 & 2 \end{pmatrix}, \qquad b = \begin{pmatrix} 4 \\ 0 \\ 3 \\ 1 \end{pmatrix}$$