

AMSC/CMSC 460: HW #3
Due: Thursday 2/15/18 (in class)

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

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 **all** the LU factorizations of

$$A = \begin{pmatrix} 1 & 5 \\ 3 & 15 \end{pmatrix}$$

in which L is a unit lower triangular (i.e., L has ones in the main diagonal).

3. Find a Cholesky factorization of

$$A = \begin{pmatrix} 4 & 1/2 & 1 \\ 1/2 & 17/16 & 1/4 \\ 1 & 1/4 & 33/64 \end{pmatrix}$$

4. Determine the LU factorization of

$$A = \begin{pmatrix} 9 & 10 & 0 \\ 12 & 26 & 4 \\ 0 & 9 & 12 \end{pmatrix}$$

in which L is a lower triangular matrix with twos on its main diagonal

5. If A has a Doolittle factorization, what is a simple formula for the determinant of A ?
6. Show how Gaussian elimination with scaled row pivoting works on the system $Ax = b$ with

$$A = \begin{pmatrix} -1 & 1 & -4 \\ 2 & 2 & 0 \\ 3 & 4 & 2 \end{pmatrix}, \quad b = \begin{pmatrix} 0 \\ 1/2 \\ 1 \end{pmatrix}$$