

MATH 5610
HOMEWORK #7, DUE TUE DEC 6

1. K&C 4.1.20 Give an example of a matrix with all positive entries such that $x^T Ax$ is sometimes negative. (a 2×2 matrix suffices)
2. Calculate by hand the Cholesky factorization of

$$\begin{bmatrix} 4 & 4 & -2 \\ 4 & 13 & 1 \\ -2 & 1 & 18 \end{bmatrix}$$

3. Implement the LU algorithm with partial pivoting.
(see notes `math5610_013.pdf:p162`). Please select at step k the largest pivot in a column, i.e. at step k select the pivot i s.t.

$$|u_{ik}| \geq |u_{jk}| \text{ for } k \leq j \leq n.$$

In Matlab this can be easily written as:

```
% choose pivot i  
[val, i] = max(abs(U(k:n, k)));  
i = i+k-1;
```

Please see the class website for sample test code and output, which you are welcome to reuse. Test your algorithm with the following matrices (B&F 6.5.4 a,c)

$$A = \begin{bmatrix} 0 & 2 & -1 \\ 1 & -1 & 2 \\ 1 & -1 & 4 \end{bmatrix} \text{ and } A = \begin{bmatrix} 1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 5 \\ 2 & 2 & 3 & 7 \\ 2 & 3 & 4 & 5 \end{bmatrix}.$$