



Institut of Numerical Mathematics

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Quiz 7

## High Performance Computing I (WS 2016/2017)

Deadline: 27 January 2017, 2pm

### Notice:

Please type your responses in a simple text file named "quiz07.txt" and submit it on our server *thales* using the following command:

```
thales$ submit hpc quiz07 quiz07.txt
```

### Question 1

Formulate an algorithm for computing the LU factorization  $A = PLU$  (where  $A$  is a  $m \times n$  matrix) based on BLAS level 1 and level 2 operations. Explain how the permutation matrix is represented and how matrix  $A$  gets overwritten with the  $LU$  factorization.

### Question 2

Assume a  $m \times m$  matrix was compactly with the LU factorization. Formulate an algorithm based on BLAS level 1 and 2 operations for the triangular solver  $B \leftarrow \alpha L^{-1}B$  where  $B$  is of dimensions  $m \times n$ .

### Question 3

Assume you have algorithms for the  $LU$  factorization with pivoting. As well as triangular solvers. Describe a frame algorithm using these building blocks for solving a matrix equation  $AX = B$ .