



Hierarchical Matrices

Summer semester 2013
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Exercise Sheet 9.

Due date: **Tuesday, 09.07.**

Exercise 1. (Worst case characterization)

Let everything be defined as on exercise sheet 8.

Assume that $\|\Xi_k\|_\infty = 2^k - 1$. Show that there is a diagonal matrix

$$D_k = \text{diag}(d_i, i = 1, \dots, k), \quad |d_i| = 1,$$

such that

$$(PAQ)_{1:k,1:k} = D_k M_k D_k U_k,$$

where $M_k \in \mathbb{R}^{k \times k}$ is the lower triangular matrix with entries $M_{ii} = 1$ and $M_{ij} = -1$, $i > j$, and U_k is an upper triangular matrix.