Numerical Methods for Elliptic and Parabolic Partial Differential Equations

Exercise Sheet 7

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Exercise 1. *Prove an one-dimensional "inverse inequality": let* $\Omega := (0,1) \subset \mathbb{R}$ *and* $\mathcal{T} := \{K_j : 1 \leq j \leq N_T\}$ *be a 1D finite element mesh of* Ω*. Prove that there exists* $C \geq 0$ *such that*

$$\|u'\|_{L^2(\Omega)} \leq Ch^{-1}\|u\|_{L^2(\Omega)} \quad \forall u \in S_1(\mathcal{T}),$$

where $h := \min_{K\in\mathcal{T}} h_K$*.*

Exercise 2. *For the triangular meshes depicted in the file* ***TriangulationMeshes.pdf****, perform the closure algorithm by inserting the necessary refinements such that the triangulation becomes conforming.*
Hint: you can draw the refinement meshes directly on the pdf document.