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2. Exersice sheet for Numerik für Differentialgleichungen auf Oberflächen

Exercise 2. Install the Matlab package DistMesh (`http://persson.berkeley.edu/distmesh/`).

Exercise 3. Consider the elliptic problem

$$-\Delta_\Gamma u + \mu u = f \qquad \text{on} \qquad \Gamma,$$

with $f \in L^2(\Gamma)$, $\mu > 0$, and a sufficiently smooth surface Γ.

Check that the assumptions of the Lax–Milgram theorem are satisfied on the Hilbert space $V = H^1(\Gamma)$. Hence, proving the existence and uniqueness result form the lecture.

Exercise 4. Consider the elliptic problem

$$-\Delta_\Gamma u = f \qquad \text{on} \qquad \Gamma,$$

with $f \in L^2(\Gamma)$, and a sufficiently smooth surface Γ.

(a) Formulate the corresponding weak problem on the Hilbert space $\mathring{H}^1(\Gamma) = \{v \in H^1(\Gamma) \mid \int_\Gamma v = 0\}$. Under which conditions on f can a solution exist?

(b) Check that the assumptions of the Lax–Milgram theorem are satisfied on the Hilbert space $\mathring{H}^1(\Gamma)$. Hence, proving the existence and uniqueness result form the lecture.

Discussed on the tutorials on 08.05.2018.