

Finite elements method

Quadratic elements:

Add a function for the \mathbb{Q}_2 FEM assembly: inspire yourself from the `Q1FEM.m` file.

Errors:

Compare the L^2 and H^1 norms of the errors in a log-log plot for both the \mathbb{Q}_1 and \mathbb{Q}_2 elements as a function of the *total* number of degree of freedom.

Lax-Milgram

Show existence and uniqueness for the problem:

$$\alpha u - \Delta u = f \text{ in } \Omega \quad (1)$$

$$u = g \text{ on } \partial\Omega \quad (2)$$

Hints: $\tilde{u} = u - u_g$ where $u \in H_0^1(\Omega)$ and the boundary is smooth enough such that $\|u_g\|_1 \leq c \|g\|_{H^{\frac{1}{2}}(\partial\Omega)}$.