Convergence_Poisson_FE_SQUARE

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In [1]: from IPython.display import display, Markdown
        with open('PoissonProblemOnSquare.md', 'r') as file1:
            PoissonProblemOnSquare = file1.read()
        #with open('DescriptionFEPoissonProblem.md', 'r') as file2:
        #    DescriptionFV5PoissonProblem = file2.read()
        with open('CodeFEPoissonProblem.md', 'r') as file3:
            CodeFEPoissonProblem = file3.read()
        with open('BibliographyFE.md', 'r') as file4:
            BibliographyFE=file4.read()
```

1 P1 FE scheme for the 2D Poisson equation

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In [2]: display(Markdown(PoissonProblemOnSquare))
```

1.1 The Poisson problem on the square

We consider the following Poisson problem with Dirichlet boundary conditions

$$\begin{cases} -\Delta u = f \text{ on } \Omega \\ u = 0 \text{ on } \partial\Omega \end{cases}$$

on the square domain $\Omega = [0,1] \times [0,1]$ with

$$f = 2\pi^2 sin(\pi x) sin(\pi y).$$

The unique solution of the problem is

$$u = sin(\pi x) sin(\pi y).$$

The Poisson equation is a particular case of the diffusion problem

$$-\nabla \cdot (K\vec{\nabla} u) = f$$

and the associated diffusion flux is

$$F(u) = K\nabla u.$$

We are in the particular case where $K = 1$.

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In [3]: display(Markdown(BibliographyFE))
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