

**AMSC/CMSC 661 - HW 5**  
**Due Tuesday March 12 (in class)**

Use Matlab's finite element PDE Toolbox to solve

$$-\Delta u = f, \quad x \in \Omega \subset \mathbb{R}^2,$$

subject to Dirichlet boundary conditions on the boundary  $\Gamma = \partial\Omega$ .

Assume that the exact solution is

$$u(x, y) = \left(x + \frac{1}{2}\right)^4 - \sin(xy).$$

Use this function to determine the function  $f$  in the equation. The exact solution should be also used in order to set the Dirichlet boundary conditions on the boundary of the domain.

You are asked to solve the problem on two domains:

#1.  $\Omega$  is the unit circle, centered at the origin.

#2.  $\Omega$  is the unit square, centered at the origin.

Solve the PDE on these two domains using Matlab's mesh and 2 refinements of it. Compute and tabulate the  $\infty$ -norm of the error at the mesh points. (For each domain you will have 3 values, coming from the three meshes).