1 Convergence of FE solver and slopes: with Conductivity defined Elementwise

We examined a superconvergence for finite element approximation using linear/quadratic/cubic basis functions and obtained the following results:

Conductivity Matrix A is defined to be constant and diagonal over all domain:

We subdivide the domain more finely to obtained small size of errors:

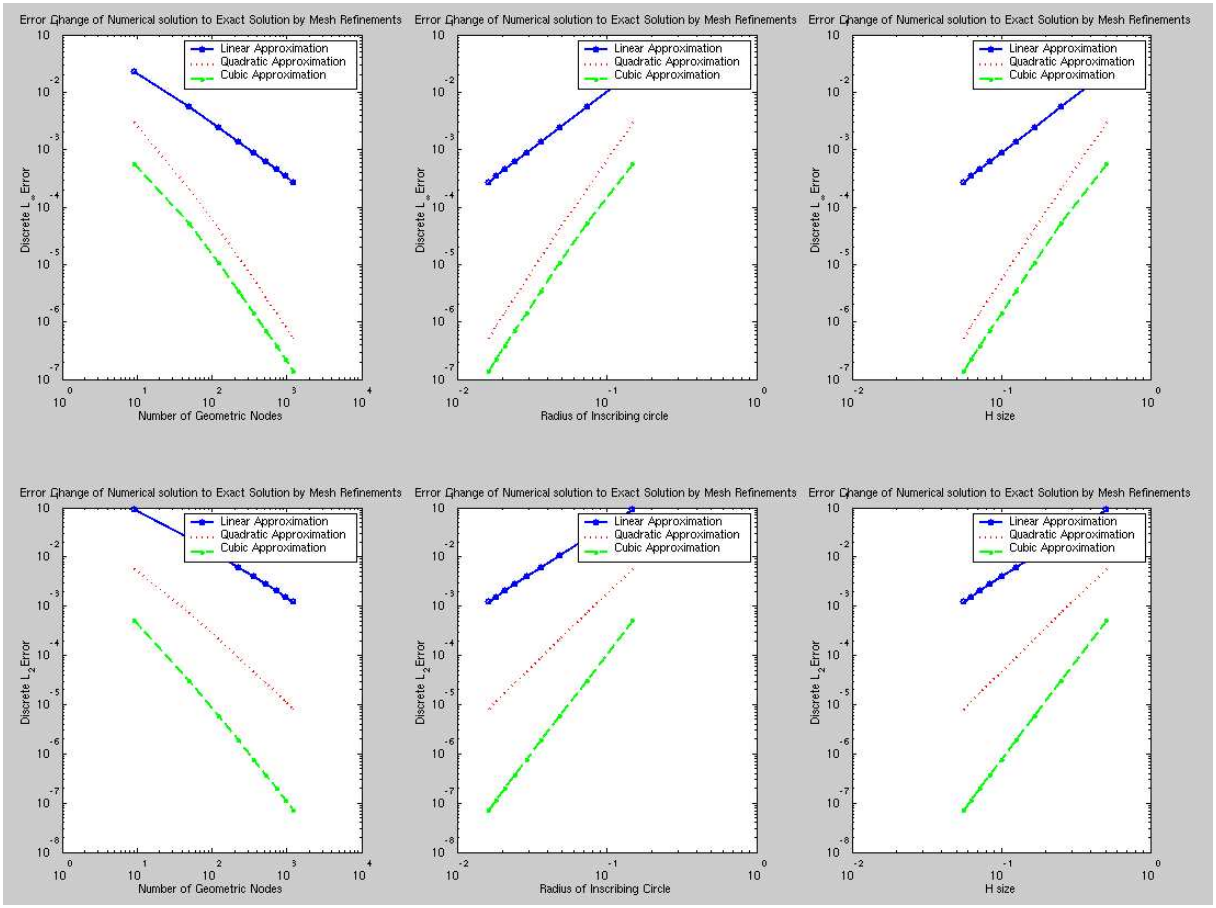

Figure 1: Continued Convergence Test N = 4, 8, 12, 16, 24,28,32,36, and 40 $u(x, y) = e^{-x^2-y^2}$ with Dirichlet Boundary of Square.

The following table shows slopes for convergence in terms of 2 kinds of norm:

Norm	Linear	Quadratic	Cubic
L^∞	2.0233236	3.9334217	3.7874339
L^2	1.9673284	2.9872180	4.0287991

This shows the decrease of error for F.E. Solver of Elliptic problem defined on a square with Mixed(Dirichlet and Neumann, not Robin) boundary conditions.

Conductivity Matrix A is defined to be constant and diagonal over each element of domain:

We subdivide the domain more finely to obtained small size of errors:

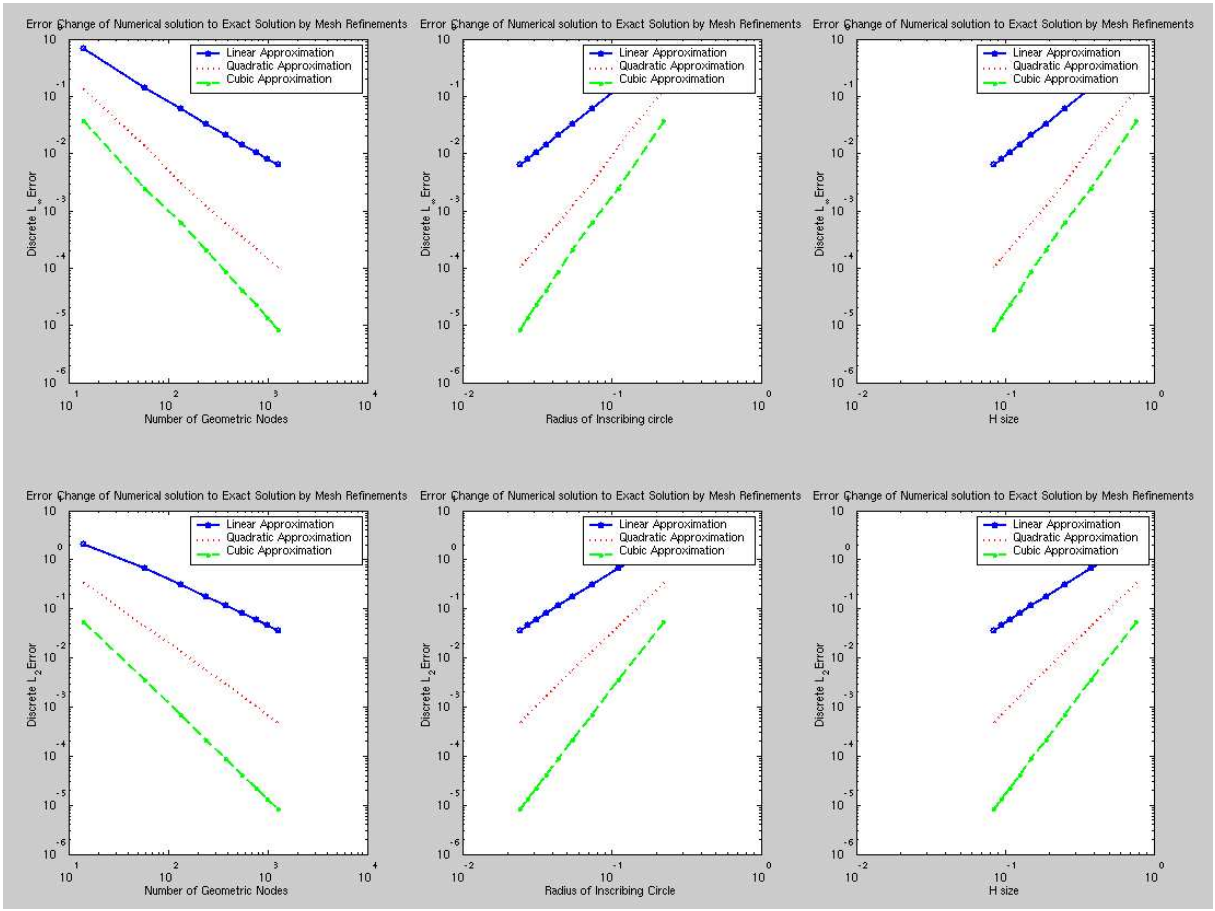

Figure 2: Continued Convergence Test N = 4, 8, 12, 16, 24,28,32,36, and 40 $u(x, y) = e^{-x^2-y^2}$ with Dirichlet and Neumann Boundary of Square.

The following table shows slopes for convergence in terms of 2 kinds of norm:

Norm	Linear	Quadratic	Cubic
L^∞	2.1286392	3.2724651	3.8174268
L^2	1.8352189	2.9784264	4.0018499