MATH 5172 Finite element method

Textbook: The mathematical theory of finite element methods

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**Chapter 0: basic concepts**

0.1 Weak formulation of boundary value problem

0.2 Ritz-Galerkin approximations

0.3 Error estimates

0.4 The finite element method: Lagrange element basis in 1D

0.6 Implementation of finite element method in 1D

**Chapter 2: variational formulation of elliptic boundary value problem**

2.1 Inner-produce spaces

2.2 Hilbert spaces

2.3 Projections onto subspaces

2.5 Formulation of symmetric variational problems

2.7 The Lax-Milgram theorem

2.8 The Cea theorem (2.8.1)

**Chapter 3: The construction of a finite element space**

3.1 The finite element

3.2 Triangular finite elements

3.5 Rectangular elements

**Chapter 5: n-dimensional variational problem**

5.1 Variational Formulation of Poisson’s Equation

5.2 Variational Formulation of the Pure Neumann Problem

5.3 Coercivity of the Variational Problem (Lax-Milgram theorem)