Dedication

To my parents, brothers and sisters

To those whom we lost

To my family

To you

Acknowledgement

All praise and thanks for to our god Allah without whose help and care and blessing, our work didn't been accomplished in this humble way.

We would like to thanks my supervisor Dr. Salwa Harvey Wadih for the great help and guidance's and kindness which she gives to us always.

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Abstract

Our goal in this research is to introduce the basic principle and tools of the finite element method in the form

$$L(u)=f(x)$$

- In chapter one We gives some definitions, theorems, remarks, and problem that is we need it to simplify the main topic.
- We discuss some fundamental results which include the approximation problem and the internal approximation of $H^1(\Omega)$.
- In chapter two We discuss some fundamental results which include the finite elements.
- In chapter three We show the application of the finite element method for solve the boundary value problems.
- We explain the effect of numerical integration and abstract error estimate.

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introduction

The finite element method is a comutional technique for obtaining approximate solutions of the P.D.E that arise in scientific and engineering applications. It's utilizes a variational problem that involves an integral of the D.E over the problem domain. This domain is divided into a number of sub domains called finite element and the solution of the P.D.E is . approximated by a sympler polynomial function on each element

These polynomials have to be pieced together so that the approximate solution has an appropriate degree of smoothness over the entries domain. Once this has been done, the variational integral is evaluated the finite element method is primarily point boundary value .problem

In this research we find that the finite element method is concerned . V_h with the constriction of finite dimensional subspace

It turns out the solution of the variation problems and variation inequality in V_h is equivalent to the solution of a finite matrix equation and finite matrix inequality, respectively the equation of such an equation .or inequality can be calculated manually or by computer