Dedication

To my Mother,

Mother,

Mother

And to my Father,

Brothers,

And Sisters

Acknowledgment

Firstly, I would like to thanks and to express my deep gratitude to may supervisor

Dr. Mohamed Hassan Mohamed khabir

For his guidance, support and his advice discussions during the prepration of this study

Also I would like to thank my family for greet suport and their continuous encouragement.

Lastly my thanks to my teacher in Sudan University of Science and Technology, Faculty of Science Deparment of Mathematics and to everyone give me any help.

Abstract

In this thesis we give a brief history and definition of fractional calculus and we discuss standard approaches to problems of fractional derivatives and fractional integrals namely the Riemann-Liouville, the Caputo respectively. Then we introduce some basic definitions and facts on partial fractional calculus theory and fixed-points theory, we give some generalizations of Gronwall's lemmas for two independent variables. Also we concern by existence of solutions to fractional order partial functional differential equations. Finally we apply the modified variational iteration method to give analytical solutions of fractional differential equations.

الخلاصة

فى هذه الاطروح أعطينا لمحة تاريخية وتعريف حساب التفاضل والتكامل الكسري وناقشنا نهجا موحدا لمعالجة مسائل المشتقات والتكاملات الكسرية ويسمى : ريمان-يوفيل وكابوتو علي الترتيب، وبعدها قدمنا بعض التعريفات الأساسية في نظرية حساب التفاضل والتكامل الكسرى ونظرية النقطة الثابتة باللإضافة الي بعض التعميمات من مسلمات جرنويل لإثنين من المتغيرات المستقلة، كذلك اهتمينا بوجود حلول للمعادلات التفاضلية الجزئية ذات الرتب الكسرية ، وأخيرا طبقنا طريقة التكرار التغايري المعدّلة لإعطاء حلول تحليلية للمعادلات التفاضلية ذات الرتب الكسرية.

Table of Contents

	Contents	Pages
	Dedication	I
	Acknowledgment	II
	Abstract	III
	Abstract(Arabic)	IV
	Table of Contents	V
Chapter One Basic Fractional Calculus		
1.1	Introduction	1
1.2	The Riemann-Liouville Differintegral	5
1.3	The Caputo Differintegral	8
Chapter Two Properties of Partial Fractional Calculus		
2.1	Notations and Definitions	10
2.2	Fixed Point Theorems	16
2.3	Gronwall Lemmas	17
Chapter Three Existence of Solutions for Differential Equations with Fractional Order		
3.1	Introduction	18
3.2.	Existence of Solutions	19
Chapter four The Modified Variation Iteration Method		
4.1	Introduction	28
4.2	Basic of the Variation Iteration Method	28
4.3	New Identification of the lagrange Multipliers	29
4.4	Illustrative Examples	31
	Conclusion	38
	References	39