

Table of contents

Introduction	iii
1 Special functions	1
1.1 Gamma function	1
1.2 Beta function	5
1.3 Mittag-Leffler function	6
2 Elements of fractional calculus	8
2.1 Riemann-Liouville fractional integral	8
2.2 Fractional derivatives	11
2.2.1 Fractional derivatives of Riemann-Liouville	12
2.2.2 Fractional derivatives of Caputo	14
2.2.3 Fractional derivatives of Grünwald-Letnikov	18
2.2.4 Properties of fractional operators	19
3 Fractional differential equations	26
3.1 Fractional differential equation of the Riemann-Liouville type	27
3.2 Fractional differential equation of the Caputo type	29
4 Existence and uniqueness of the solution for FDE	32
4.1 Some fixed point theorems	32
4.2 Cauchy problem of fractional differential equation	34
4.3 Boundary problem of fractional differential equation	37

5 Conclusion	43
Bibliography	43