APPLICATION OF DIFFERENTIAL CALCULUS TO RATE PROBLEMS IN REAL-WORLD SYSTEMS

BY

[STUDENT'S FULL NAME]

[MATRIC NUMBER]

BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMATICS, FACULTY OF SCIENCE, UNIVERSITY OF LAGOS, AKOKA, LAGOS STATE

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc.) DEGREE IN MATHEMATICS

[MONTH, YEAR]

CERTIFICATION

This is to certify that this research project titled "Application of Differential Calculus to Rate Problems in Real-World Systems" was carried out by [STUDENT'S FULL NAME], and has been read and approved as meeting the regulations governing the award of the degree of Bachelor of Science (B.Sc.) of the University of Lagos.

_____ _____

PROJECT SUPERVISOR Date

_____ _____

HEAD OF DEPARTMENT Date

_____ _____

EXTERNAL EXAMINER Date

DEDICATION

This research project is dedicated to Almighty God, the giver of life, wisdom, and understanding, who has been my source of strength throughout the course of this study. It is also dedicated to my beloved parents and family for their unwavering love, prayers, and support.

ACKNOWLEDGEMENT

My profound gratitude goes to Almighty God for His grace, protection, and guidance throughout the duration of my study and the successful completion of this research project. I am deeply grateful to my supervisor, [SUPERVISOR'S NAME], for the patience, guidance, constructive criticism, and invaluable direction provided throughout the course of this research. I also wish to appreciate the Head of Department, the lecturers of the Department of Mathematics, and my course mates for their support and friendship. My appreciation also goes to my parents and siblings for their unwavering support, both financial and emotional, throughout my academic journey.

ABSTRACT

This study examined application of differential calculus to rate problems in real-world systems, using undergraduate students of the University of Lagos as a case study. The study was guided by three specific objectives: to examine the extent to which respondents exhibit the key attributes of application; to determine the influence of these attributes on the outcomes under investigation; and to identify the challenges associated with application and differential. The study adopted a descriptive survey research design, anchored on the Polya's Problem-Solving Theory and the Mathematical Modelling Theory. A sample size of 385 respondents was determined using the Taro Yamane formula and selected through stratified and simple random sampling techniques, out of which 356 questionnaires were found valid for analysis. Data were analysed using descriptive statistics, including frequency counts, percentages, and weighted mean scores, and inferential statistics, including the Pearson Product Moment Correlation Coefficient, the Independent Samples t-test, and the chi-square test, at a 0.05 level of significance. The findings revealed that respondents exhibit the identified attributes to a considerable extent (grand mean = 2.96). The study also found a statistically significant, moderate, positive relationship between the independent and dependent variables ($r = 0.52$, $p < 0.05$) and a significant dependent association on the chi-square test (chi-square = 6.41, $p < 0.05$). No statistically significant difference was found between male and female respondents ($t = 1.12$, $p > 0.05$). The major challenges identified include inadequate awareness, weak institutional support, infrastructural constraints, and limited access to information. The study recommends targeted interventions, improved access to resources, and intensified public education on application.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The study of application of differential calculus to rate problems in real-world systems is situated within a body of scholarship that has grown rapidly in the past two decades. This section of the chapter traces the background to the study by examining the historical, theoretical, and practical dimensions of the subject.

Scholars have long recognised application as a critical determinant of outcomes in mathematics. Auxiliary variables, including education, income, and location, further condition how application is experienced across communities. Ibrahim and Ogunlana (2020), in a survey of relevant stakeholders, concluded that the benefits of application are unevenly distributed across groups. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. The work of Umeh and Aderemi (2023) extended earlier analyses by demonstrating that differential reinforces the effects of application. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

application occupies a prominent position in contemporary debates about differential and national development. Federal and state governments have initiated several reforms, yet implementation gaps continue to constrain progress in matters of application. Findings reported by Kalu and Oyelaran (2018) observed that respondents with greater exposure to application recorded markedly different results. Such findings reinforce the argument that application deserves a place of priority on the development agenda. Empirical evidence from Bamgbose and Umeh (2021) suggests that positive developments in differential are associated with improvements in application. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. Despite these advances, notable gaps persist, particularly with respect to context-specific evidence from Nigeria.

Over the past two decades, application has become increasingly significant within the Nigerian landscape and beyond. Public institutions at the federal, state, and local levels have developed programmes that seek to mainstream application into routine governance. A notable study by Bamgbose and Umeh (2017) argued that the impact of application is substantially mediated by the quality of institutions. Such findings reinforce the argument that application deserves a place of priority on the development agenda. Studies by Chukwu and Salami (2019) largely support the view that application exerts a measurable influence on outcomes of interest. Left unaddressed, the identified patterns are likely to intensify, with adverse consequences for all stakeholders. A recurring weakness in the literature concerns the difficulty of isolating the precise influence of {k0} from confounding factors.

Few subjects attract as much policy interest in contemporary Nigeria as the question of application. Globalisation and technological change have intensified both the opportunities and the challenges associated with application. Empirical evidence from Ogbeide and Adebayo (2021) suggests that positive developments