A COMPARATIVE STUDY OF REGULA FALSI'S METHOD, NEWTON'S METHOD, AND STEEPEST DESCENT'S METHOD FOR SOLVING NONLINEAR EQUATION

MUHAMMAD IDHAM FIKRI BIN FAIZAL

Thesis Submitted in Fulfillment

of the Requirement for Bachelor of Science

Mathematical Modelling and Analytics (Hons.)

College of Computing, Informatics and Mathematics

Universiti Teknologi Mara

Feb 2025

ABSTRACT

This study presents a comparative analysis of numerical methods which is the Regula Falsi method, Newton's Method, and Steepest Descent method. These methods are employed for solving nonlinear equations. To compare the methods, eight different types of functions were tested with these three methods, the Regula Falsi method, Newton's Method, and Steepest Descent method also will be tested with differences in tolerance and initial guess. The performance of these methods was analyzed by using performance profiles based on the number of iterations and CPU time. The results show that Newton's Method surpasses the other methods, achieving the fastest convergence and the least CPU time. Regula Falsi shows moderate performance, while Steepest Descent lags in efficiency due to its higher number of iteration and CPU time. With possible applications in a variety of scientific and technical fields, the results highlight the importance of using the right numerical approaches to maximize computational efficiency.

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious, the Most Merciful. All praise is due to Allah, the Cherisher and Sustainer of the worlds. Firstly, I would like to express my sincere gratitude to Madam Ruhana binti Jaafar, my supervisor, for her essential help and guidance during the writing of this thesis. I also want to express my gratitude to the Universiti Teknologi Mara lecturers for helping me to continue my education. I would especially like to thank my partner, Tasnim Atikah, for coming up with the idea and working with me to create this thesis. I am equally grateful to all my friends who have supported me in many ways, support and encouragement during this research journey. Lastly, I am profoundly thankful for the unwavering love and support of my family, especially my beloved parents, whose encouragement has been my greatest strength.

TABLE OF CONTENTS