USING NUMERICAL ANALYSIS METHOD IN SOLVING NONLINEAR EQUATION

ASYIKIN BINTI ZALKIFLY

Thesis Submitted in Fulfilment of the Requirement for Bachelor of Science (Hons.) Mathematical Modelling and Analytics in the College of Computing, Informatics and Mathematics Universiti Teknologi MARA

AUGUST 2023

ABSTRACT

This research project explores and compares three iterative techniques, namely Newton, Halley, and Steffensen methods, for finding roots in numerical analysis. The objectives of the study were to find the root of the equation, analyse the convergence behaviour and performance of these methods, and identify the best method between these three methods. The convergence behaviour of each method was assessed by analysing the number of iterations required for convergence. The computational efficiency was also investigated by finding their CPU time. In conclusion, the research project successfully explored and compared the Newton, Halley, and Steffensen methods for finding roots in numerical analysis. The findings highlight the favourable convergence properties of the Halley method. Therefore, from the finding the best method can be determined based on the fastest convergence. However, further research is needed to validate the results across a broader range of equations and to consider other practical aspects such as computational efficiency and stability.

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful.

All praises to Allah and His blessing for the completion of this thesis. I thank God for all the opportunities, trials and strength that have been showered on me to finish writing the thesis. My humblest gratitude to the holy Prophet Muhammad (Peace be upon him) whose way of life has been a continuous guidance for me.

Foremost, I would like to express my sincere gratitude to my supervisor Madam Rohayati binti Mat Ripin for the continuous support of my degree study and research, for her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me a lot in this research and writing of this thesis.

I also would like to thank my friends for the stimulating discussions, for the sleepless nights we were working together before deadlines, for all the fun we have had and give a great motivation to finish the entire project. Next I also would like to thank my father, Zalkifly bin Md Sharif and my mother, Noor Hasimah binti Othman for the support and help me a lot through this degree study.

Last but not least, I want to thank me for believing in myself to successfully doing all this hard work, also for never quitting in doing this research till the end.

TABLE OF CONTENTS