E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"

23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
Universiti Teknologi MARA (UiTM) Cawangan Johor
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https://tiec-uitmpg.wixsite.com/tiec

e ISBN 978-967-0033-34-1

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Editors

Aznilinda Zainuddin

Maisarah Noorezam

e ISBN: 978-967-0033-34-1

Published in Malaysia by
Universiti Teknologi MARA (UiTM) Cawangan Johor
Kampus Pasir Gudang, 81750 Masai

A-ST125: MASTERING DERIVATIVES

Aishah Mahat, Muhamad Yadiy Putra Muhamad, Ahmad Fawzan Abd Naddin, and Ikhwan Syahmi Shahrin
College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus, Masai, Malaysia

Corresponding author: Aishah Mahat, aishahmahat@uitm.edu.my

ABSTRACT

Engineering students are required to pass a calculus course, with a significant focus on the topic of differentiation. However, many students struggle with this concept, resulting in lower scores and a lack of confidence in solving mathematical problems. These challenges can affect their overall academic performance and future learning. To address this, a teaching aid called Mastering Derivatives has been developed. This resource is designed to help students overcome difficulties in mathematics and create a more engaging learning environment. Mastering Derivatives provides concise notes and essential formulas for each subtopic, making it easier for students to grasp and apply calculus concepts. Additionally, it includes a range of questions—beginner, intermediate, and advanced—intended to enhance problem-solving skills and comprehension, especially for those struggling in the subject. Although primarily targeted at students from UiTM's Faculty of Engineering enrolled in Calculus I, Mastering Derivatives is particularly beneficial for those who performed poorly in Assessment 1. With this digital tool, it is hoped that both lecturers and students will experience an improved teaching and learning experience, leading to better academic outcomes.

Keywords: calculus, Mastering Derivatives E-Book, mathematical formula, differentiation

1. Product Description

Mastering Derivatives is an innovative educational tool designed to support students in mastering Calculus I, specifically targeting the topic of differentiation. This product is tailored for engineering students enrolled in the MAT 183 course, which covers key areas such as Functions, Limits & Continuity, Differentiation, Applications of Differentiation, and Applications of Integration. While the tool addresses all topics in the course, its primary focus is on differentiation. Each week, students will receive mathematical tips, essential formulas, and relevant calculus problems based on the syllabus for that week. At the end of each week, students are encouraged to meet with their lecturer to discuss and review their solutions. Mastering Derivatives aims to strengthen students' understanding of calculus concepts, providing a structured and interactive approach to improving their knowledge and problem-solving skills.

2. Step by step and Product Model

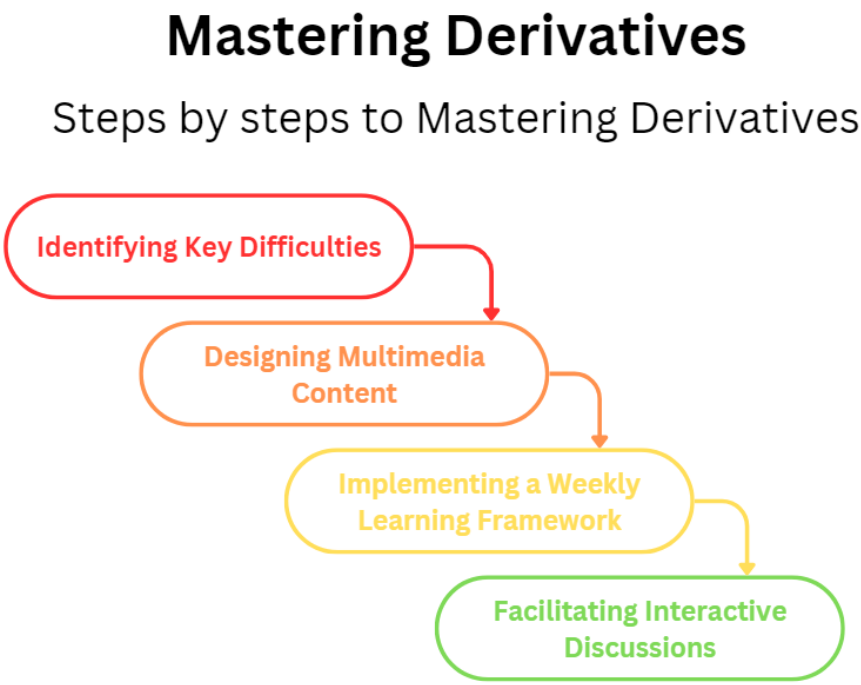

Figure 1. Steps by steps to Mastering Derivatives

Steps to Mastering Derivatives by identifying key difficulties, this step focuses on diagnosing the common challenges and misconceptions students face when learning derivatives. Next, designing multimedia content, such as videos and animations, is designed to simplify complex concepts and make learning more interactive. This is followed by implementing a weekly learning framework, where derivative concepts are introduced incrementally, enabling consistent practice and reinforcement. Finally, interactive discussions are facilitated, encouraging collaboration and active engagement to clarify doubts and deepen understanding. Together, these steps aim to improve mastery of derivatives effectively.

The cover page for "Mastering Derivatives: Simplify the Complex!!" effectively combines visuals and text to convey the essence of the eBook. The title, written in bold blue font, stands out and immediately captures the reader's attention, emphasizing the focus on understanding and mastering derivatives. The tagline, "Simplify the Complex!!," adds a motivational touch, highlighting the book's goal to make a challenging topic approachable and engaging. Surrounding the title are hand-drawn sketches of mathematical tools like rulers, calculators, graphs, and equations, symbolizing the practical application of calculus and derivatives in problem-solving. This design adds a creative and approachable feel, making the subject less intimidating.

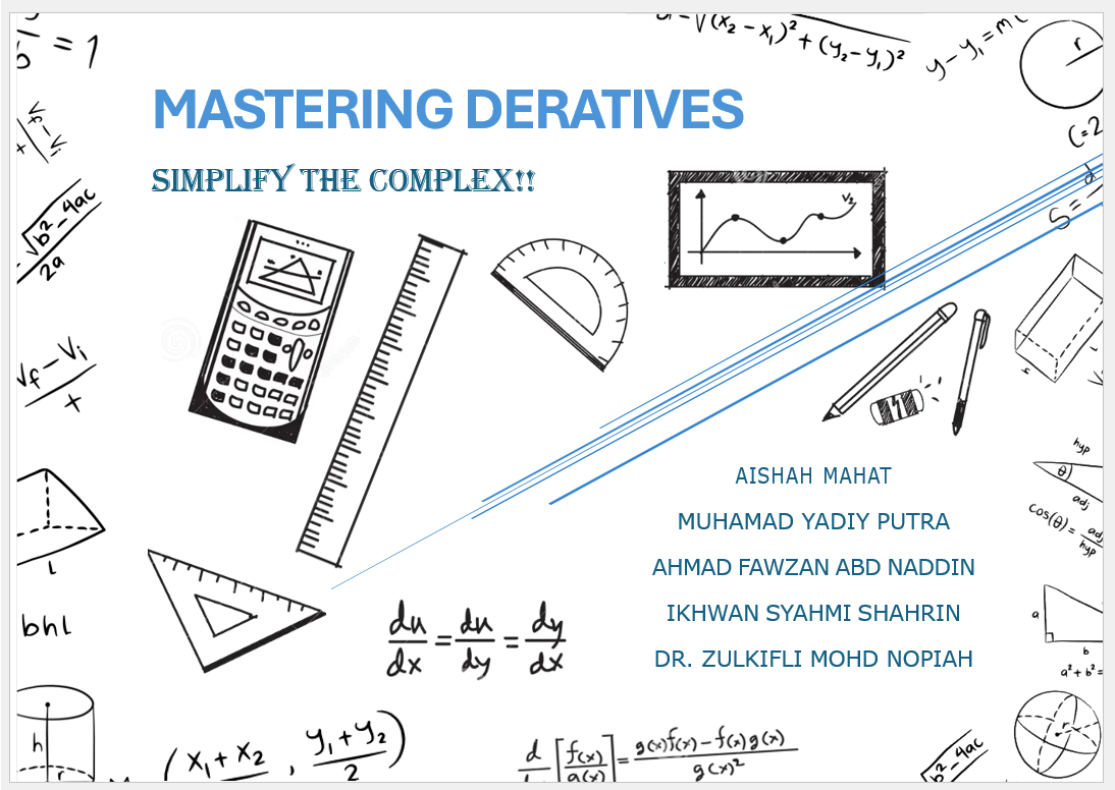

Figure 2. Product Model for Mastering Derivatives

3. Novelty and uniqueness

"Mastering Derivatives" offers a practical, structured approach to learning differentiation, combining traditional textbook content with digital tools like videos, animations, and interactive quizzes. These features enhance engagement and make complex calculus topics more accessible. The e-book is organized into beginner, intermediate, and advanced levels, allowing students to progress at their own pace. Tailored questions and instant feedback help students master essential differentiation techniques step by step, ensuring a comprehensive learning experience. Unlike traditional textbooks that focus heavily on theory, this e-book emphasizes practical problem-solving and application. Designed to support students struggling with calculus, "Mastering Derivatives" is equally valuable for learners at all levels seeking to strengthen their understanding. Its combination of interactivity, structured content, and practical problem-solving techniques makes it a unique and effective resource for mastering differentiation.

4. Benefit to mankind

“Mastering Derivatives" is designed to help students struggling with calculus build confidence and competence in differentiation. By presenting complex topics in an engaging and accessible way, the e-book simplifies challenging concepts, allowing learners to understand the material more effectively. The self-paced learning structure encourages independent practice, enabling students to strengthen their problem-solving skills and apply these techniques in various academic and professional fields, such as engineering,

economics, and data science. Beyond improving academic performance, the e-book fosters a deeper appreciation for mathematics, empowering students to solve real-world problems. Its user-friendly approach not only supports learning but also nurtures the development of critical skills for future success. As students gain confidence in their ability to tackle calculus, they lay a solid foundation for tackling advanced concepts and excelling in their careers. "Mastering Derivatives" is not only an academic tool but also a resource for personal growth and future innovation.

5. Innovation and Entrepreneurial Impact

"Mastering Derivatives" utilizes modern technology to transform the way students learn calculus. The e-book offers a problem-solving-based approach, categorizing content into beginner, intermediate, and advanced levels, ensuring accessibility for learners of all levels. Step-by-step solutions enhance understanding, while the digital format allows for anytime, anywhere access, making it more practical and sustainable compared to traditional printed textbooks. This digital innovation aligns with the growing trend of online learning and offers a scalable solution with global reach. It not only reduces the need for printed materials, making it eco-friendly, but also provides cost-effective distribution, potential updates, and customization for different educational institutions. The versatility of "Mastering Derivatives" positions it as a valuable tool for diverse learning environments, offering a practical and engaging approach to mastering differentiation. Its potential to impact how students learn mathematics and disrupt traditional educational models is significant, making it a forward-thinking educational resource.

6. Potential Commercialization

"Mastering Derivatives" has significant potential for adoption in universities and colleges teaching calculus, as well as a broad appeal to learners, educators, and professionals. Its flexible design allows it to cater to diverse audiences, from engineering students to those seeking extra support with calculus concepts. The e-book's adaptability ensures seamless integration into various courses, making it a valuable resource for academic institutions.

The subscription-based model, with regular updates and licensing options for institutions, enhances its scalability and accessibility. Its digital format enables cost-effective distribution through online platforms, ensuring a wide reach across educational and professional markets. With opportunities for customization—such as language translations or expanded coverage of other calculus topics—"Mastering Derivatives" can meet the needs of different regions and educational systems. Combined with interactive features like quizzes and instant feedback, it stands out as a modern, practical alternative to traditional textbooks, appealing to a global audience.

7. Acknowledgment

We would like to express our heartfelt gratitude to everyone who has supported us in developing "Mastering Derivatives."Our sincere appreciation goes to our team members—Aishah Mahat, Muhamad Yadiy Putra, Ahmad Fawzan Abd Naddin, and Ikhwan Syahmi Shahrin—from Universiti Teknologi MARA (UiTM), Pasir Gudang, Johor, for their hard work,

dedication, and collaboration. The diversity of ideas and teamwork have been key to the success of this project. We also thank Universiti Teknologi MARA (UiTM), Pasir Gudang, Johor, for providing the platform, resources, and opportunities to undertake this meaningful project.

8. Authors' Biography

Aishah Mahat is a mathematics lecturer at Universiti Teknologi MARA Johor's Pasir Gudang campus. She joined UiTM as a Senior Lecturer in the College of Computing, Informatics, and Mathematics. Her interests include optimization and mathematics management.

Yadiy Putra is a first-year student at Universiti Teknologi MARA (UiTM), Pasir Gudang, Johor, pursuing his studies under the Faculty of Mechanical Engineering. As a highly motivated individual, he is eager to expand his knowledge and expertise in the field of Mathematics.

Ahmad Fawzan is currently enrolled in his first year at Universiti Teknologi MARA (UiTM), Pasir Gudang, Johor, under the Faculty of Mechanical Engineering. Despite his initial apprehension in the field of mathematics, he is determined to enhance his knowledge and proficiency in calculus. He believes that participating in this project will not only enhance his skills but also assist others struggling with similar challenges by providing a clear approach to problem-solving

Ikhwan Syahmi is a first-year full-time diploma student at Universiti Teknologi MARA Johor's Pasir Gudang campus, he is pursuing his studies in Diploma of Electrical Engineering (Electronics). With a passion for innovation and problem-solving, he is motivated by his curiosity and the desire to make a difference in the world of electronics.