

# Analysis of Informatics Engineering Students in Completing the Problem of Calculus I

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**Abstract**—The aims of this study is to find out the extent to which students understand the basic concepts of calculus I by analyzing test results after learning. This study belongs to a qualitative descriptive study that seeks to describe the analysis of student errors in solving problems in calculus I. Subjects in this study are students who take courses in calculus I in the Informatics Engineering Study Program, Faculty of Computer Science, Banten Jaya University. This study revealed some significant student errors in solving problems in calculus I. In this study, researchers collected information through diagnostic tests and interviews with students. The analysis shows that the majority of students' mistakes do not master the basic concepts of derivative functions, trigonometric derivatives, and integral functions. There are some mistakes, including mistakes due to carelessness, mistakes in process skills, errors in understanding questions, and errors in using notation. The results of the analysis, it is necessary for lecturers of calculus I courses to be able to develop strategies in learning so that students can be thorough and correct in completing questions, also can be done by increasing the practice of questions, so students are accustomed to various forms of questions, especially questions related to basic skills in calculus I.

**Keywords:** *error, qualitative descriptive, calculus, function, limit*

## I. INTRODUCTION

The study of calculus is very broad, therefore in the informatics engineering study program courses in calculus are divided into 2, namely calculus I and calculus II. Calculus I is a compulsory subject and is a pre-requisite for taking calculus II. The material in Calculus consists of a system of real numbers, inequality, absolute values, functions, derivatives, and integrals. Based on data from the results of the final semester exams, some student grades are unsatisfactory. That is because some students make mistakes in working on calculus I, especially on derivative materials or often called differential.

According to Cooney & Cotton (Khiat, 2010), some students view mathematics as interesting and some view mathematics as boring. The ability of students to receive and understand course material varies, many factors greatly influence it. Lack of mastery of recovery materials is one of the reasons students experience learning difficulties (Ardiawan, 2015). The mistakes made by students need to be analyzed further so that we get a picture of the weaknesses of students being tested (Ulifa, 2014).

Obstacle analysis is a process that consists of different steps, namely identity, clarification of explanation, correction, assessment, therapy, and prevention of errors. In this study, there were student errors that were caused by several things, among them because of conception, conception, preconceptions, and misconceptions (Wahyuni, 2017). The cause of errors in students is that students cannot memorize the formula to be used, are not careful enough in understanding questions, are not careful in answering questions, have no preparation or have not repeated the material that has been taught, no longer remember in solving the problem, and not enough time in taking the test (Abidin, 2012). The results of the analysis (Wahyuni; 2017) there are several types of mistakes made by students, namely not mastering the language, lack of process skills, lack of understanding of problems, errors in transformation, and lack of understanding of correct scientific notation. Many factors cause difficulties for students in taking courses in calculus I, namely lack of interest in learning and low basic calculus skills. With the results of the analysis that leads to the assumption that calculus I have nothing to do with informatics techniques, less able in the operation of the reduction and addition of functions, less capable in fractional operations, less like learning calculus I (Mutakin; 2015).

Errors that arise in solving differential equations are conceptual, procedural, and factual errors. General causes of errors, because students do not optimize the initial knowledge that has been owned related to the concept of derivatives and integrals and students do not fully understand the concepts and procedures in solving differential equations (sulistyorini; 2017).

Based on the description of the explanation and previous research, there needs to be an analysis of student errors in solving differential / derivative problems in this calculus I course. To be able to know and identify which further describes more clearly what mistakes made by students in solving problems in calculus I. In this study deepened the reasons why students made these mistakes so that researchers can learn and correct things that are lacking in learning.

## II. METHODOLOGY

This research was conducted at the informatics engineering study program, computer science faculty, Banten University. This research lasted for 1 semester on students

who took courses in calculus I. This study was a qualitative descriptive study. The purpose of this study is to describe the mistakes made by students in working on calculus I problems.

The main instrument in this research is the researcher himself because in this study the researcher is deciding in collecting data, analyzing data and presenting data. While the assistive instruments in this study were test and interview questions. The research data was collected purposively.

Data collection techniques used in this study were tests and interviews. The test used in the form of a description of questions consisting of 5 questions related to the material derived with the limit rules, trigonometric derivatives and integral functions given to informatics engineering students who take courses in Calculus I. While interviews conducted by researchers by interviewing the subject directly based on the results written to the questions given, aim to clarify the written answers of the subject and to obtain information on the causes of students making mistakes. The interview guidelines are not structured, because they are only the outline of the problem. Questions asked to each student are not the same, because every student has different problems. Then the valid data are then analyzed and conclusions can be drawn.

**III. RESULTS AND DISCUSSION**

Based on the results of the data analysis above, the researcher found some mistakes made by students when completing the final semester exam questions. In the final semester exam questions that appear about the material derived functions, trigonometric derivatives, and integral functions.

**TABLE 1. ERROR WITH DERIVED BASIC MATERIAL**

<b>Error Type</b>	<b>The suspected cause of the error</b>
The basic concept of the derivative is not used, so the results from the description of the answer are not satisfactory.	derivatives. So that is supposed to be multiplication but is converted into a sum. Causing students to change formulas with their thoughts.
<p><b>2. Tentukan turunan dari soal dibawah</b></p> <p>a. <math>f(x) = 17x^7 - 4</math></p>	
<p>Interview result: The lack of interest in studying calculus, due to too many formulas and calculations, also does not master the basic concepts of calculus.</p>	

**TABLE 2. ERROR IN DERIVATIVE COMPLETION USING THEOREM**

<b>Error Type</b>	<b>The suspected cause of the error</b>
The basic concept of trigonometry is not perfect, so in reducing the concept of trigonometry must be wrong	Lack of understanding of the concept of trigonometry, so students cannot reduce the value of the trigonometry.
<p><b>2. Tentukan turunan dari soal dibawah</b></p> <p>a. <math>f(x) = 17x^7 - 4</math></p> <p>b. <math>f(x) = \frac{1+\cos x}{\sin x}</math></p>	
<p>Interview result: Lack of knowledge about the basic concepts of trigonometry related to the basic concepts of calculus.</p>	

**TABLE 3. ERROR WITH INTEGRAL FUNCTION COMPLETION**

<b>Error Type</b>	<b>The suspected cause of the error</b>
The mistakes made are too complex, making it difficult to score the description of the answer.	Because students do not understand the integral concept with various types of questions. Basically, students know what is integral, but when they encounter more complex problems, they tend to be confused and don't even know what kind of formula to use.
<p><b>3. Tentukan penyelesaian dari integrasi</b></p> <p>a. <math>\int (8x^2 + 4x) dx</math></p> <p>b. <math>\int 3x^2(2x^3 + 9)^3 dx</math></p>	
<p>Interview result: The carelessness of students in calculating integrals is not following applicable rules. And the lack of student knowledge about integral concepts.</p>	

#### IV. CONCLUSION

Multiplication about algebra, lack of student knowledge about derivative science and integral with various theorems, student carelessness has done when calculating

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