

Calculus 1

Syllabus Number 3F114
Basic Major Subjects
Requisites 2 credit
FUKUDA, Chieko

1. Course Description

Calculus 1 is the introduction part of analysis and the foundation of many mathematical subjects in university. Analysis is an important mathematical field that describes numerous phenomena appearing in natural science and engineering by mathematical expressions and contributes to elucidating these phenomena. First, with regard to the main function of one variable, we treat limit, concept of differentiation, derivative, Taylor's theorem, concept of integration, primitive function, definite integration, etc. And these items will be continued to Calculus 2, Applied Mathematics 1, Applied Mathematics 2 and specialized subjects. This subject leads to future learning, such as the method of handling functions, grasping the properties of individual functions, and the shape of graphs. In this course, you will acquire knowledge, techniques, and attitudes about DP 3.

2. Course Objectives

1. Understand the continuity and differentiability of functions, and apply to specific functions.
2. Understand the nature of the function (including the inverse trigonometric function and the limit of the indefinite form), and can reliably calculate the derivative of the basic function.
3. Understand the concept of Taylor's theorem and Maclaurin's theorem. Be able to apply them to specific functions.
4. Be able to reliably calculate the definite integral (including improper integral) of the basic function.

3. Grading Policy

Your final grade will be calculated according to the following process: small tests (15%), mid-term examination¹ (25%), mid-term examination² (25%), term-end examination (35%).

4. Textbook and Reference

Textbook
Yoshihiro Tashiro

"Mathematical Differential Integration of Engineering"
ISBN 978-4-627-04932-1
Morikita Publishing

5. Requirements(Assignments)

In the first lesson, we will distribute teaching materials include a summarize of the theme, the range of the textbook, basic questions and practical questions for each lesson, and present them to LMS as well. As a pre-assignment, students refer to the teaching materials, check the contents of the lesson, and solve the basic questions. (60 minutes)

Each lesson is as follows:

- (1) Do a small test for the confirmation of previous lesson.
 - (2) Confirm the basic questions solved in pre-assignment.
 - (3) Solve advanced problems in group work, and discuss them with other students.
 - (4) Submit a report of the advanced problems. (Answer presented to LMS)
- As a post-assignment, solve the practice questions specified in the teaching materials and check the contents of the lesson. (60 minutes)

6. Note

If your reports of each submission or the midterm examinations are not in the target level, we will prepare students for additional classes outside of the scheduled time table.

7. Schedule

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| [1] | Distribution of the teaching materials of all lessons and explanation how to learn each lesson.
Differential (pp.12-20):
Limit of function, a differential function. |
| [2] | Differential (pp.20-31):
Tangent, increase / decrease of function and maximum / minimum. |
| [3] | Differentiation (pp.32-40):
Function continuity and differentiation. |
| [4] | Derivative (pp.40-42):
derivative of composite function. |
| [5] | Midterm exam 1.
Differentiation of various functions 1(pp.43-47):
Exponential function, Logarithmic function. |
| [6] | Differential (pp.47-54):
Differentiation of various functions 2: Arc degree, Trigonometric function. |
| [7] | Differential (pp.56-69):
Mean value theorem, increase / decrease of function and maximum / minimum. |
| [8] | Differential (pp.70-94):
Differentiation of various functions 3: Inverse function. |

- [9] Midterm exam 2.
Integral (pp.96-98):
Concept of indefinite integration.
- [10] Integral (pp.99-102):
Integration by substitution.
- [11] Integral (pp.103-105):
Integration by parts.
Integration of various functions 1: Exponential function, Logarithmic function.
- [12] Integral (pp.106-110):
Integration of various functions 2: Trigonometric functions, Irrational functions.
- [13] Integral (pp.111-115):
Integration of various functions 3: Special form functions.
- [14] Integral (pp.116-129):
Definite integral, Integration by parts and Integration by substitution.
- [15] Integral (pp.130-137):
Application of definite integration Area and volume.