

# Calculus 1

Syllabus Number

4B105

Basic Major Subjects

Elective 2 credit

ISOGAI, Takeshi

## 1. Course Description

This course provides the basis of differential and integral calculus to students who study information science. The course includes the following contents:

Derivatives, increasing/decreasing of functions, local maximum/minimum of function, derivatives of composite function, higher-order derivatives, derivatives of inverse function, Taylor expansion, indefinite integral, definite integral, calculation of the area and the volume.

## 2. Course Objectives

The purpose of this course is to enable students to obtain basic knowledge about derivatives and integral of function of one variable, and to improve mathematical skills and the ability in order to consider problem solving.

## 3. Grading Policy

Evaluation will be conducted based on the results of the subject acquisition test (50%) and the results of the submission report (50%). However, it is a requirement for unit acquisition that students must pass the two reports and the score of the subject acquisition test will be 60 points or more.

We will provide feedback based on comments on the submission report.

## 4. Textbook and Reference

Textbook

Yoshihiro Tashiro Mathematics for Engineers Calculus (2nd edition) Morikita Shuppan (1999)  
ISBN 978-4-627-04932-1

Reference

Sonoko Ishimura Calculus That You Can Learn Easily Kyoritsu Shuppan (1999) ISBN 978-4-320-01633-0

## 5. Requirements(Assignments)

A lesson that deepens understanding of learning contents by reading the textbook based on the commentary for each "lecture" written in the sub text and solving the understanding degree test described in each "lecture". Please answer all the questions in the test. Other problems and exercises are posted in the text, so please solve them and deepen your understanding further.

## 6. Note

## 7. Schedule

- [1] Limit and continuity of function: Convergence and divergence of function, Limit value, Continuity of function, Intermediate value theorem
- [2] Derivative of polynomial function: Average rate of change, Differential coefficient and derivative, Equation of tangent line for a curve
- [3] Increase/decrease of functions and local maximum/minimum: Increase/decrease of function, Increase/decrease table, Local maximum/minimum, Maximum/minimum value of function
- [4] Derivatives of trigonometric functions: Arc method, Derivative of trigonometric function
- [5] Derivatives of various functions, Derivatives of composite function: Derivatives of fractional function, Derivatives of irrational function, Composite functions, Derivative of composite function
- [6] Derivative of exponential function, logarithmic function: Derivative of exponential function, Derivative of logarithmic function, Logarithmic differentiation method
- [7] Theorem of intermediate value, higher order derivative: Theorem of intermediate value, Second derivative, Concavity and convexity of graph, Inflection point
- [8] Inverse functions and their derivatives: Inverse function and their derivatives, Inverse trigonometric function and their derivatives, Parametric equation for a graph, Indeterminate form, l'Hôpital's rule
- [9] Taylor's theorem and Taylor expansion: Higher order derivatives, Taylor's theorem, Taylor expansion, Maclaurin expansion
- [10] Basics of indefinite integration: Primitive functions, Indefinite integral, Integration by substitution, Integration by parts
- [11] Indefinite integral of various functions: Indefinite integral of fractional function, Indefinite integral of irrational function
- [12] Basis of definite integral: Definite integral, integral interval, Relationship between definite integral and area of figure
- [13] Integration by substitution and integration by parts in definite integral: Integration by substitution in definite integral, Integration by parts in definite integral, Division quadrature
- [14] Application of definite integral: Area of figure, Volume of solid, Length of curve
- [15] Summary: Testing conducted (50 minutes)