

# Exercise of fundamental mathematics

Syllabus Number

0L191

Remedial Subject

Free Elective 1 credit

FUKUDA, Chieko

## 1. Course Description

This course is designated to achieve the Educational Goals 2, and 3 of General Basic Subjects.

First, students acquire a wide knowledge of natural science based on the Educational Goals 3. In each lesson, students listen to lectures about fundamental mathematics and solve mathematical problems. It helps students acquire the necessary and fundamental mathematical skills to learn mathematics at university.

Second, students achieve logical, critical and active manners based on the Educational Goals 2. In pre-assignment, students solve the basic question. In learning when attending a lesson, they acquire logical and critical thinking skills and communication skills through advanced problem solving in group work. In post-assignment, students solve practice questions. It enhances the development of students' skills in making self-regulated learning.

## 2. Course Objectives

(1) Students prepare to study basic mathematics in their first year at the university. They will learn "calculation of numbers and symbols", "Quadratic functions", "Exponent functions and Logarithmic functions" and "Trigonometric functions".

(2) Students will be able to learn autonomously through pre-assignment.

(3) Students can logically think through advanced problem solving in group work, and be able to communicate it to other students

## 3. Grading Policy

(1) Confirmation tests (25%). They are returned after scoring. Example answer is presented on LMS.

(2) Two mid-term examinations in the 6th and 11th lesson (25%, 25%). Example answer is presented on LMS.

(3) A term-end examination is conducted at the end of the term (25%). Example answer and explanation are presented on LMS.

## 4. Textbook and Reference

Textbook

Okamoto Kazuo ed. New Edition Mathematics Series "New Edition Fundamental Mathematics, Revised Edition"

ISBN 978-4-407-34887-3 Jikkyo publication,

Reference

Mathematics I and Mathematics II textbooks and reference books used in high school.

## 5. Requirements(Assignments)

In each class session, the following cycle (1), (2), and (3) will be repeated

(1) As a pre-assignment, One week before each class, 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. Students refer to the teaching materials, check the content of the lesson, and prepare for a lesson. (60 minutes)

(2) Each lesson is as follows.

1) test on the previous lesson's content.

2) Examples in the preparatory study will be explained and related problems will be practiced.

3) During the class, we distribute Exercise-step1. Students will do exercises and explanations, with some group work.

(3) As a post-assignment, Each student solves the Exercises-step2 distributed at the end of the class, and check the answers. (Answers will be shown on the LMS) (60 minutes)

## 6. Note

1) Class materials will be distributed in each class. They will also be presented on the LMS.

2) If a student's score does not reach the target level in a confirmation test or midterm examination, the student will receive individual guidance outside of class hours.

## 7. Schedule

[1] Distribution of the teaching materials and explanation how to learn each lesson.  
Numbers and Expressions (1)  
Addition, subtraction, and multiplication of polynomials, factorization (textbook pp.8-19)

[2] Numbers and Expressions (2)  
Division of polynomials, fractional expressions (textbook pp.20-27)

[3] Numbers and Expressions (3)  
Real numbers, calculation of square roots, complex numbers (textbook pp. 28-41)

[4] Quadratic equations and higher-order equations  
Quadratic equations, solution formulas, discriminant (textbook pp. 44-51)  
The remainder theorem and factorization, higher order equations (textbook pp.85-90)

[5] Quadratic functions (1)  
Functions, Quadratic functions and graphs, Quadratic function determination, Maximum and minimum of quadratic functions (textbook pp.52-64)

- [6] Midterm Exam 1  
Contents of the 1st through 5th lessons. Answers and explanation.
- [7] Quadratic functions (2)  
Graphs of quadratic functions, quadratic equations, and quadratic inequalities (textbook pp. 65-79)
- [8] Exponential Functions  
Extensions of exponents, exponential functions and graphs (textbook pp. 114-121)
- [9] Logarithmic functions  
Logarithms and their properties, ordinary logarithms (textbook pp. 125-129, 135)
- [10] Equations and inequalities involving exponential and logarithmic functions  
Equations and inequalities for exponential functions, graphs and equations and inequalities for logarithmic functions (textbook pp. 122-124, 130-134)
- [11] Midterm Exam 2  
Contents of the 5th lesson and the 7th through 10th lessons, Answers and explanations
- [12] Trigonometric functions (1)  
Trigonometric ratios, extensions of trigonometric ratios (textbook pp.140-147)  
General angle and arc degree method, trigonometric functions (textbook pp.158-160)
- [13] Trigonometric functions (2)  
Interrelationships of trigonometric functions, equations and inequalities involving trigonometric functions (textbook pp. 148-149, 161-163, 171-172)
- [14] Trigonometric functions (3)  
Addition theorem for trigonometric functions, formula for double angle, composition of trigonometric functions (textbook pp.176-181)
- [15] Trigonometric functions (4)  
Sine and cosine theorems, area of a triangle (textbook pp. 150-156)