Calculus I
Course Outline
Course 0941002 Section 02, Spring 2022
Mondays 10:00 - 10:50, Thursdays 10:00 - 11:50, Room: N14 #106
Chungbuk National University
Updated on 04.03.2022. (Change of classroom and office hour)

This document prevails whenever interpretations of the course syllabus (the version in 개신누리) and that of this document conflict.

Instructor: Dr. Byungdo Park

Email: byungdo@g.cbnu.ac.kr

Office hours: Mondays 17:00–17:50 at E1-1 #110 or by appointment.

Class webpage: Announcements, homework, exam schedules and other relevant information will be posted on the following webpage: https://byungdo.github.io/teaching/s2022_calc1.html which is also accessible via instructor's webpage: https://byungdo.github.io/

Textbook:

- 고두원 외, *미적분학*, 초판(2021), 경문사, ISBN-13: 9791160734997.

References:

- Richard E. Johnson and Fred L. Kiokemeister, *Calculus With Analytic Geometry*, 6th Edition (1978), William C Brown Pub, ISBN-13: 9780205059171.
- Michael Spivak, *Calculus*, 4th Edition (2008), Publish or Perish, ISBN-13: 9780914098911.
- Tom M. Apostol, *Calculus, Vol. 1: One-Variable Calculus, with an Introduction to Linear Algebra*, 2nd edition (1991), Wiley, ISBN-13: 9780471000051.

Prerequisites: None, however the instructor assumes that you have mastered mathematics of the level of Precalculus (0941004) and the standard analytic geometry in high school curricula.

Overtallies: This section of Calculus I is for *statistics* major freshmen. The instructor does not stop students from other majors enrolling in this section, however, if the class is full, overtallies will be granted only to statistics major freshmen entered in March 2022.

Course description: Calculus on steroids. This is an year-long calculus course for college freshmen who already have a decent exposure to calculus. The first half, which is this course, covers all conventional topics in single-variable calculus including limit of functions and sequences, differentiation, integration, series convergence tests, Taylor expansions, and calculus on polar coordinates. Phrasing differently, this one-semester course covers virtually everything typically covered in an

year-long Calculus I, II sequence in the US. Naturally, the pace will be quite rapid and at times you gotta bite the bullet since there won't be much room for you to relax and appreciate the material.

Course objectives: At the end of the course students should be able to:

- Evaluate limit of functions and understand formal definitions of limits and continuity.
- Find derivatives and apply differentiation rules.
- Understand the meaning of first and second derivatives and apply it for a curve sketching and related rates problems.
- Find antiderivatives by applying various integration techniques.
- Understand fundamental theorem of calculus and apply it for various practical calculations involving integrals.
- Do calculus in polar coodinate.
- Evaluate limit of sequences and carry out convergence tests for series.
- Understand the radius of convergence of power series as well as power series representation of functions.

Details on problem solving: Problems arising in this course will be requiring proofs and calculations based on the mathematical discourse in class. Through dialogues and discussions during each lecture as well as the instructor's office hours, the instructor will guide students approaching to problems that they will have to address.

Details on class proceeding: The instructor will give lectures on the material following the weekly lesson plan and assign weekly homework problems.

Grading policies: 40% from miterm exam, 40% from final exam, 12% from homework, and 8% from attendance. Absolute evaluation [A: 100–90 points, B: 89.99–80 points, C: 79.99–70 points, D: 69.99–60 points, F: less than 60 points] with curving. Here the curving means a horizontal shift of the bell-shaped curve of %-score distribution in either directions using a rational constant which is determined at the discretion of the instructor. Grading policies in the academic integrity policies are applied in higher priority than the above grading policies.

Homework policies: A list of homework problems will be posted on the class webpage roughly in weekly basis. The instructor will assign as many homework problems as it is needed to master the subject. The instructor will scan through each submitted homework and assign a score 2, 1, or 0 depending on quality of work. The homework score for the total grade will be calculated based on the following formula: $(\sum_{i=1}^{h} h_i \cdot n_i)/(\sum_{i=1}^{h} 2 \cdot n_i)$, where h is total number of homework assignment, h_i is the score for the i^{th} homework score, n_i is the number of problems in the i^{th} homework.

Homework submission guidelines: All the following requirements must be met.

- You should submit your homework to `byungdo@g.cbnu.ac.kr` (be sure not to use other email addresses of the instructor).
- Your email title should contain [수학I과제], your CBNU ID, name, and homework number. An example: "[수학I과제] 2022123456 홍길동 Homework #1 제출" Note that the instructor's inbox has a filter and if you do not satisfy this requirement, your homework might get lost.
- Your email body should satisfy the email policy (see below).
- Your homework has to consist of a single PDF file. No other file formats are accepted.
- The file has to be attached to your email as a file and not as a download link; i.e., Large-size file attachments (대용량첨부) are not accepted. If your file size is too large, use freely available PDF compressor.
- Your homework has to be submitted before the deadline. Please do not send any homework past due because it won't be read and it won't be accepted. It will simply waste time for both you and your instructor.

Any homework that does not meet any one of the above requirements will not be accepted.

Attendance policies: Attendance data will be collected in every class meeting and will be used for determining your final grade. You will get a grade F if you have missed more than 25% of class meeting hours. Up to 3 hour of absence there is no penalty on your score. After that, you lose 1% of total score for an absence to each 50-minute long class meeting, with a maximum total loss 8% from your total score. If you have permissible reasons for your absence in accordance with the Regulation on Academic Management of the CBNU Article 52(1) (충북대학교 학사운영규정 제52조(공결승인) 제1항), you will need to contact your Department Secretary to follow the procedure for getting an approval on your absence bringing proper documentation as proof. That said, you have to fill out a form and submit it along with appropriate proofs before the absence or after seven days of the date of absence.

Assessment of learning: The assessment will be primarily done by the abovementioned grading policy. Nonetheless, the instructor will also take into account students' devotions and efforts for this course as well as their enthusiasm as a future educator so that those qualitative elements are not going to be neglected.

Important dates:

- Thursday May 5th – Children's day.
- Monday June 6th – Memorial day.

Weekly lesson plan: Those sections under the bracket "$[\cdots]$" stands for *presto*; i.e., it will be covered in a very fast and brief manner). Double brackets would then mean *prestissimo*.

> Week 1: Functions, [[trigonometric functions]], inverse trigonometric functions, inverse hyperbolic functions, limit of functions – intuitive approach, continuity (Sections 1.1–1.5)

Week 2: Derivatives and laws of differentiation, chain rule, derivatives of inverse functions, implicit differentiation (Sections 2.1–2.2)

Week 3: Derivatives of (inverse) trigonometric, exponential, logarithmic functions, and [hyperbolic and inverse hyperbolic functions], [[higher derivatives]] (Sections 2.3–2.6)

Week 4: Extrema, mean-value theorem, L'Hôpital's theorem (Sections 3.2–3.3)

Week 5: Increasing and decresing functions and the first derivative test, concavity, the second derivative test, asymptotes, curve sketching, [[optimization, Newton's method]] (Sections 3.4–3.8)

Week 6: [Antiderivatives, substitutions, integration by parts], partial fractions, irrational functions as as integrands (including trigonometric substitutions), trigonometric integrals (Sections 4.1–4.5)

Week 7: Definite integrals and their properties, fundamental theorem of calculus (Sections 5.1–5.3)

Week 8: Leeway for catch-up. Midterm exam covers up to Chapter 4.

Week 9: Substitutions, integration by parts, improper integrals, [[approximation of integrals]], areas, volumes. (Sections 5.3–6.2)

Week 10: Length of curves and areas, mean value property, [[work]], [rectangular coordinate system], polar coordinate, graphs in polar coordinate (Sections 6.3–7.3)

Week 11: [Cylindrical and spherical coordinate system], [[parametric equations]], [calculus in polar coordinate]. (Sections 7.4–7.8)

Week 12: Limit of sequences and functions, convergence of series. (Sections 8.1, 1.4, 1.5, 8.2)

Week 13: Convergence tests and absolute convergence. (Sections 8.4)

Week 14: Power series, Maclaurin series, Taylor series. (Sections 8.5)

Week 15: Leeway for catch-up. Final exam covers all sections we covered.

Accommodating disabilities in learning and assessment: The instructor is committed to providing access to all students. If you need accommodation in classroom or in assessment, you are encouraged to set up an appointment with the instructor at your soonest availability so that we can figure out the best way to acoommodate you. Possible accommodations include, but not limited to, provision of materials from lectures, permission to hire an assistant for taking notes, audio-recording lectures, and aid/assistant devices, extension of due dates for assignments, alternative assessment for in-class presentations, extension of exam hours, and provision of an accommodating exam locations and exam sheets.

Academic integrity: It is expected that you will complete all exams without giving or receiving help from anyone. Electronic devices are not allowed in any in-class exam. You may talk to other

students about the homework but you must then complete the homework yourself. The grader will trust students and will not apply any prejudice. However, if the grader has found an evidence that you have violated those policies, the grader reserves the right to investigate by summoning you to come in to his office, reproduce and explain your own solutions in front of the chalkboard. If you cannot provide a coherent and consistent explanation to your own solution to a problem or do not show up to the investigation without a documented official cause and/or an emergency, the minimum punishment would be score zero to that problem and lowering your letter grades by 2 letters. (For example, if you were to receive A+, it will become C+.) In addition to that, your other homework solutions may possibly be a subject of investigation. The investigation session will be both video and audio recorded, and the result of the investigation (including video/audio recording of the investigation) can be reported to the department or the university center. You MUST drop this course if you cannot comply with this policy.

Email policies: All emails addressed to the instructor should have a title containing the course title, name, and a brief summary as well as a body starting with "Dear Professor Last name" and ending with "Sincerely, Your full name", which contains greetings, your name and department, a brief and clear purpose written politely. Any email deviating from this format will not be accepted and will be dismissed without any rejection reply. The corresponding disadvantages are solely and entirely on the student.

이메일 작성규칙: 담당교수에게 보내지는 모든 이메일의 제목에는 과목명, 신원, 요지가 포함되어 있어야 하며, 본문은 반드시 "OOO 교수님께"로 시작하여 인사, 신원, 용건을 간단 명료하고 예의 바르게 기술한 후 "OOO 올림" 또는 "OOO 드림"으로 끝나야 합니다. 이 형식에 어긋난 이메일은 접수하지 않으며, 반려회신 없이 종결합니다. 이에 따른 불이익은 전적으로 학생의 단독 책임입니다.

English usage policies: Lectures in this course will be given in Korean, but most of written materials will be in English. For example, the course syllabus, most of boardwork, exam problems, homework, solutions to exams, course webpage, announcements, but not limited to those. English sentences to be used in this course should be understandable enough based on the regular Korean public high school curriculum. Nonetheless if your English skill is not competent enough to follow this course or understanding announcements, it is your responsibility to ask the instructor to also provide an explanation in Korean. The instructor will take those questions under an attitude of helping students' understanding, but taking into account the contents of each question, he may reject the question or advise the questioner to visit him during his office hour to ask the question about Korean translation.

영어 사용 정책: 본 강좌에서 강의는 한국어로 이루어집니다만, 글의 경우 대부분 영어가 사용될 것입니다. 수업계획서, 칠판 판서의 대부분, 시험문제, 숙제, 시험문제에 대한 풀이, 강좌의 웹페이지, 공지사항 등이 예가 될 수 있으며, 이상 열거한 것들로 한정되지 않습니다. 본 강좌에서 사용될 영어 문장들은 한국의 공립 고등학교 정규 교과과정을 기초로 할 때 충분히 이해될 수 있어야 합니다만, 만약 수강생 본인의 영어실력이 본 강좌를 따라오거나 공지사항을 이해하기에 충분치 못하다면, 담당 교수에게 한국어로 추가 설명을 요청하는 것은 학생 본인의 몫입니다. 담당 교수는 학생들의 이해를 도우려는 자세로 질문을 받을 것이지만, 질문의 내용에 따라 답을 하지 아니할 수도 있고, 면담시간에 개별 방문하여 질문하도록 안내할 수도 있습니다.