MATH 1023
Honors Calculus I
2023-24 Fall

https://canvas.ust.hk/courses/52212

Lecture

Instructor	**Prof. Frederick Tsz-Ho FONG**
E-mail	frederick.fong@ust.hk
Office	Room 3488, Department of Mathematics
Class Time	Tuesdays and Thursdays 10:30am-11:50am
Class Venue	Lecture Theatre L

Tutorial

Session	T1A and T1B	T1C and T1D
Teaching Assistant	**LIU Wenwei**	**CHOY Ka Hei, Jimmy**
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Class Time	T1A Tue 4:30pm-5:20pm	T1C Mon 4:30pm-5:20pm
	T1B Tue 3:00pm-3:50pm	T1D Mon 5:30pm - 6:20pm

Course Description

Course outline: This is the first part of a one-year honors course on single-variable calculus, with strong emphasis on mathematical concepts and logical reasoning skills. Topics include: sequences and their limits, functions, continuity, extreme value theorem, intermediate value theorem, derivatives and differentiation rules, differentiability, mean value theorem, l'Hopital's rule, Taylor expansion, and applications of derivatives.

Credits: 3

Prerequisite: Level 5 or above in HKDSE Mathematics Extended Module M2.

Intended Learning Outcomes (ILOs)

Upon completion of the course, students are expected to:

(1) build a strong mathematical background, in both conceptual and computational aspects, for future studies in mathematically oriented majors, including mathematics, physics, engineering;
(2) be equipped with workable knowledge of single-variable calculus well beyond the level of HKDSE M2;
(3) get familiar with the rigorous approach of single-variable calculus; and
(4) develop logical reasoning and critical thinking skills necessary for potential math majors in the pure mathematics tracks.

Student Learning Resources

Major References: Instructor's Lecture Notes

Recommended References (for complementary or additional readings):

(1) Lecture notes written by Prof. YAN Min
(2) *Introduction to Calculus and Analysis* by Richard Courant, Fritz John
(3) *Elementary Analysis: The Theory of Calculus* by Kenneth A. Ross
(4) Any former HKALE Pure Math (Calculus) textbook

GRADING

Homework: There will be about 10 problem sets. No late homework will be accepted. Each homework can be individual or collaborative: students can form a group of 1 to 3 people to discuss with each other on the homework problems, and submit one copy of the problem set as a team.

Every student in the same team will receive the same score for that problem set. To avoid "free-riders", students are allowed to form different groups in different problem sets.

Examinations: There will be one 3-hour midterm exam, and one 3-hour final exam.

	Percentage	Assessing Course ILOs
Homework	20%	1, 2, 3, 4
Midterm	40%	1, 2, 3, 4
Final	40%	1, 2, 3, 4
Total	100%	

Extra points will be added for those who performed in the final exam much better than they did in the midterm, according to the following formula:

Grading Scheme:

Total score

$$= \max\{\lambda\,\text{homework} + \mu\,\text{midterm} + \nu\,\text{final} : \lambda \in [0, 0.2], \mu \in [0, 0.4], \nu \in [0.4, 0.7], \lambda + \mu + \nu = 1\}$$

Letter Grades: Try to aim at getting a total of 75% or above for A-/A/A+, about 45% or above for B-/B/B+, and about 25% or above for C-/C/C+. The course will not be graded on a curve, yet homework and exams will be challenging to almost all, but not all, HKUST freshmen.

TENTATIVE SCHEDULE

Week #	Topics
1	limit of sequences - rigorous definition
2	squeeze theorem
3	monotone sequences, Cauchy sequences
4	infinity, limit of functions
5	rigorous definition of function limits
6	rigorous definition of function limits, con't
7	continuity
8	derivatives, differentiability
9	chain rule, implicit differentiations
10	monotonicity, first derivative test
11	mean value theorem, l'Hospital's rule
12	Taylor series, higher-order Taylor approximation
13	higher derivative test, convexity and concavity