MATH 1023 – Honors Calculus I

Fall 2025-2026 Course Outline

Lecture

Instructor:	**Prof. IP, Ivan Chi-Ho**
Office:	Room 3470 (Lift 25-26)
Office Hour:	By appointment
E-mail:	ivan.ip@ust.hk

Tutorials

TA:	**Chan, Tsz Wai**	**Gao, Bingsong**	**Hung, Kin Ting Ken**	**Zhang, Weihong**
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TA Session:	T1A	T1B	T1C	T1D

Time and Venue

Lecture:	Tuesday, Thursday	12:00 – 13:20	LTL (CYT Building)
Session T1A:	Monday	18:00 – 18:50	Room 2302 (Lift 17-18)
Session T1B:	Wednesday	10:30 – 11:20	Room 6555 (Lift 29-30)
Session T1C:	Wednesday	09:30 – 10:20	Room 4579 (Lift 27-28)
Session T1D:	Monday	12:30 – 13:20	Room 1527 (Lift 22)

Course Description

This is the first in the sequence MATH 1023 – MATH 1024 of honors courses in one-variable calculus, with strong emphasis on rigorous mathematical reasoning.

This course will cover limit and differentiation.

Limit: limit of sequence, properties of limit, monotone sequence, Cauchy criterion, infinity, limit of function, continuous function, intermediate value theorem, invertible continuous. function

Differentiation: linear approximation, derivative, properties of derivative, monotone function, extrema, means value theorem, high order approximation, high order derivative, Taylor expansion, convex function, sketch of graph, Newton's method.

Prerequisite:	Level 5 or above in HKDSE Mathematics Extended Module M2
Exclusion:	MATH 1012 (prior to 2025-26), MATH 1013, MATH 1014, MATH 1024
Credits:	3

Intended Learning Outcomes

Upon completion of this course, students are expected:

1. Develop an understanding of the core ideas and concepts of Single Variable Calculus.
2. Be able to recognize the power of abstraction and generalization, and to carry out mathematical work with independent judgment.
3. Be able to apply rigorous, analytic, and numeric approach to analyze and solve problems.
4. Be able to explain clearly concepts and calculations from Single Variable Calculus.

Assessment and Grading

The assessment consists of 10 Homeworks, Midterm and Final Examination.

Homework. There will be 10 Homework Sets, due on every Sunday night. Students should submit each homework in the form of a LaTeX-typed PDF, or a clearly scanned handwritten PDF on the Canvas system before the deadline. A page limit penalty will be imposed.

Examinations. There will be a 3-hour midterm exam during Week 6-8 (exact date to be confirmed), and a 3-hour final exam arranged by ARO.

Grading Scheme. This course will be assessed using **criterion-referencing** and grades will **not** be assigned using a curve.

The grade is computed by taking the maximum of the weights such that the total is 100%:

	Weight	Assessment ILOs
Homework	20%	1,2,3,4
Midterm Examination	10–40%	1,2,3,4
Final Examination	40–70%	1,2,3,4

Grading Scheme

Letter grades will be assigned depending on overall performance.
Obtaining a total point of 90% or above, or top 10%, wil lbe guaranteed an A+.
Obtaining a total point of 70% or above will be guaranteed an A-range.
Obtaining a total point of 30% or above will be guaranteed a passing grade.

Students who beat DeepSeek-V3.1 (or the latest version) in both the Midterm and Final Exam will be guaranteed an A grade.

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of advanced calculus, on both the conceptual understanding and computational aspects.
B	Good Performance	Shows good knowledge and understanding of advanced calculus, but did not master the subject completely.
C	Satisfactory Performance	Possesses adequate knowledge of advanced calculus, but may not perform well even in the normal calculus stream.
D	Marginal Pass	The student is only able to recall some fragments of topics and is able to complete some of the easiest computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete some of the easiest computations.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity — HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Late submission Policy. To ensure fairness for students who submit assignments on time, a penalty for late submission is listed as follows, according to the timestamp of Canvas:

- Late submission between 0 to 24 hours, 50% penalty will be applied.
- Late submission for more than 24 hours will not be accepted.

Make-up Exam Policy. Make-up Midterm Exam will only be considered with at least a 4-hour notice and with proper support documents. Make-up Final will follow the make-up exam policy set by ARO.

Communication and Feedback. Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include comments and corrections. Students who have further questions about the feedback including marks should consult the instructor or TA within five working days after the feedback is received through email or discord.

Course AI Policy. The use of Generative AI is permitted, but students should be critical of the responses generated by the AI and do not blindly copy the generated responses to your homework.

Teaching and Learning Activities

Aside from lectures, to master this course students are required to do as many exercises as they can to get familiar with the subject. A lot of the exercises are available within the Lecture Notes.

- We will work through problems provided in Worksheet format during every lecture, part of them are Examples from the lecture notes.
- Tutorial Problem Sets will be discussed during the Tutorial Session. Solutions are available after each tutorial.

Student Learning Resources

Lecture Notes written by Prof. Yan Min (1023+1024).
Lecture Slides and **Lecture Videos** will also be available on canvas after class.

Additional References:

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

Tentative Schedule

	Part I: Limit
Week 1	Limit of Sequence
Week 2	Rigorous Definition of Sequence Limit
Week 3	Monotone Sequence, Cauchy Criterion
Week 4	Divergence, Infinity
Week 5	Limit of Functions
Week 6	Rigorous Definition of Function Limit
Week 7	Continuity, IVT, Inverse Function
	Part II: Differentiation
Week 8	Linear Approximation
Week 9	Property of Derivatives
Week 10	Monotone, Extrema, First Derivative Test
Week 11	Mean Value Theorem, L'Hopital Rule
Week 12	Taylor Expansion
Week 13	Higher Derivative Test, Convex Function