MATH1013 Calculus IB
L06 (Fall 2024) Course Outline

1. Instructor

Name: Dr. CHENG Kam Hang Henry
Office: Room 3486 (L25–26)
Email: keroc@ust.hk
Office hours: (Tentative) Mon 15:30 – 17:30; you may also just drop in my office any time or make an email appointment beforehand to ensure I am there.

2. Teaching assistants

(T06A, T06B)
Name: Mr. YAN, Bokai
Email: byanac@connect.ust.hk

(T06C)
Name: Ms. ZHENG, Lifang
Email: lzhengah@connect.ust.hk

3. Meeting time and venue

Lectures:	(L06)	Tue & Thu 15:00 – 16:20	Lecture Theater B	
Tutorials:	(T06A)	Tue 13:00 – 13:50	Library LG4-26	(Starting on **Sep 10**)
	(T06B)	Mon 9:30 – 10:20	LG3009 (L10–12)	(Starting on **Sep 9**)
	(T06C)	Mon 18:00 – 18:50	6580 (L27–28)	(Starting on **Sep 9**)

4. Course description

This is an introductory course in **one-variable calculus**, the first in the Calculus I and II sequence, designed for students who passed HKDSE Mathematics Extended Module M1/M2. Major topics include: functions and their limits, continuity, derivatives and rules of differentiation, applications of derivatives, basic integral calculus.

Credit points: 3
Prerequisite: **Level 3 or above** in HKDSE Mathematics Extended Module M1/M2
Exclusions: MATH1012/1014/1020/1023/1024

5. Intended learning outcomes

Upon successful completion of this course, students are expected to be able to:

1. compute limits, derivatives and simple integrals of functions in one variable;
2. express quantitative relationships using the language of functions; and
3. apply conceptual knowledge of differential calculus in modeling and problem solving for further studies in science, engineering or other mathematically related fields.

6. Assessment scheme

- **WeBWorK assignments (10%)**: Assessing ILOs 1, 2 and 3
  WeBWorK homework sets will be assigned from time to time and can be accessed via https://webwork.math.ust.hk/. The use of ChatGPT or other generative AI tools are not strictly prohibited, but are not encouraged either.

- **Extra problem sets (0%)**: Assessing ILOs 1, 2 and 3
  Although extra problem sets are not counted towards the final grade, you are highly encouraged to work out the solutions to the problems. WeBWorK assignments are usually too easy compared with the mid-term test and the final exam, while the problem sets will provide sufficient practice exercise.

- **Midterm Test (35%)**: Assessing ILOs 1, 2 and 3
  The mid-term test will be scheduled on **Sunday, October 27 from 10:15 to 11:45**. It will tentatively cover all materials from Chapter 1 to Chapter 3.

- **Final Exam (55%)**: Assessing ILOs 1, 2 and 3
  The final exam will take three hours, and its schedule will be confirmed in due course. It will cover everything that has been taught in the course.

The mid-term test and the final exam will normally be **closed-book written tests**, and **calculators will not be allowed** during the tests. The exact exam arrangements may be modified in the event of unexpected emergencies.

Letter grades:
The assignment of letter grades is criterion-referenced. Students should aim at getting a course total of 85% or above for A-/A/A+, about 70% or above for B-/B/B+, and about 40% or above for a passing grade.

Grade descriptors:

Grades	Short description	Elaboration on subject grading description
A	Excellent	The student has mastered almost all techniques of basic one-variable calculus taught in the course, and has excellent and thorough conceptual understanding on the subject content.
B	Good	The student has mastered most computational techniques of basic one-variable calculus taught in the course, yet the understanding of some challenging concepts may not be deep enough.
C	Satisfactory	The student meets the minimum expectation of the instructor, has acquired some basic computational techniques of the subject, but some concepts were not clearly understood.
D	Marginal pass	The student is only able to recall some fragments of topics and is able to complete some of the most elementary computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete elementary computations.

7. Student learning resources

- Lecture note by the instructor
  (Accessible via our course website https://canvas.ust.hk/courses/59430)

- Reference texts:
  J. Stewart, D. Clegg and S. Watson, *Calculus: Early Transcendentals* (Metric version, 9th edition), Cengage.
  J. Hu, W. Li and Y. Wu, *Calculus for scientists and engineers with Matlab*.

8. Tentative course schedule

Week	Lecture dates	Topics
1	Sep 3, Sep 5	Basic set theory, numbers and intervals
		Inequalities and absolute values
2	Sep 10, Sep 12	Functions and graphs
		Elementary functions
3	Sep 17, Sep 19	Limits of a function
		Rules of limits
4	Sep 24, Sep 26	Infinite limits and limit at infinity
		Continuity
5	Oct 3	Derivatives
		Rules of differentiation
6	Oct 8, Oct 10	Chain rule
		Techniques of differentiation
7	Oct 15, Oct 17	Rates of change
		Linear approximations, differentials
8	Oct 22, Oct 24	Newton's method
		Maximum and minimum of functions
9	Oct 29, Oct 31	Mean value theorem
		l'Hôpital's rule
10	Nov 5, Nov 7	Curve sketching
		Optimization
11	Nov 12, Nov 14	Antiderivatives
		Riemann sums and integrals
12	Nov 19, Nov 21	The Fundamental Theorem of Calculus
		Substitution rule
13	Nov 26, Nov 28	Final review