

# HKUST Dual Program 2023 (Introduction to Pre-stage Level: Mathematics)

# 9 September 2023 (Sat)

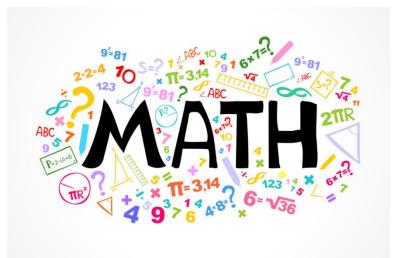
# **Introduction of Dual Program (Mathematics) Structure**

### **<u>3-level progressive structure</u>**

- Pre-stage Level \*: Bridging Courses to Level 1
- Level 1\*: Accelerated Matching Courses in Secondary School Level
- Level 2 #: Introductory University Level
- Level 3 #: University Level Courses on Specialized Subjects
- \*: Non credit-bearing
- #: Credit-bearing

### Aims of Pre-stage Level

- Equip students with basic and fundamental mathematics knowledge and techniques (mostly in Algebra) for learning elementary Calculus
- Build up good foundation of mathematics for "Level 1" onwards
- Develop appreciation of the beauty of mathematics from different perspectives
- Present mathematical ideas logically



# About Pre-stage (MATH) Course

### **Content:**

Mainly based on selected topics of **HKDSE Core Mathematics**, with some **additional topics and applications** delivered

#### **Course Instructors:**

Dr. Hugo Wai Leung <u>MAK</u> (Class A, English) Mr. Hoi Sang <u>KONG</u> (Class B, Chinese) Dr. Kwun Lun Alan <u>CHU</u> (Class C, English)

#### Common Lecture Notes (in English) will be used for all classes

Duration: 16 "3-hour lectures" plus 2 "3-hour tutorials", Saturdays of Nov 2023 – May 2024 (2:00 pm – 5:00 pm)

https://cdgt.hkust.edu.hk/sites/cdgt.prod01.ust.hk/files/Dual%20Program/L1/2023TimetableL1/MATH\_2023DPPS\_REF.pdf

#### **Pre-requisites\*:**

Basic understanding of **elementary Algebra** Certain **mathematical maturity / related experience** will be a bonus \* From 2022/23 onwards, all Pre-stage applicants are required to sit for a <u>screening test</u>. The performance will be an important selection criteria.

# **About Pre-stage Course**

### **Assessment:**

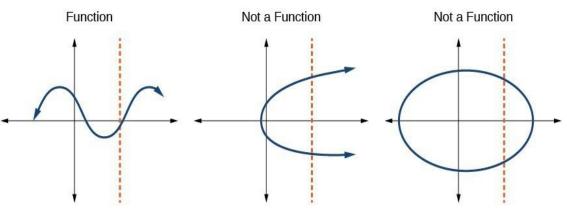
- 4 HWs (30%)
- 1 Midterm Test (17 Feb 2023) (30%)
- 1 Final Examination (4 May 2023) (40%).

\*Outstanding students will be promoted to DP Level 1.

### **Topics Covered:**

- Numbers and Basic Algebra
- Polynomials and Binomial Theorem
- Functions and its Geometric Representations
- Coordinate Geometry
- Trigonometric Formulae
- Sequences and Series





# **Brief Descriptions of Topics**

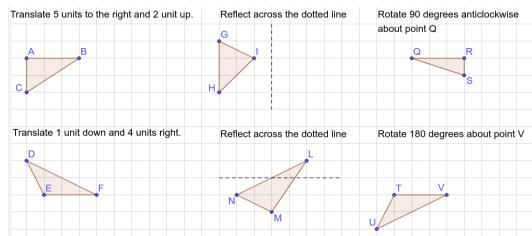
**Numbers and Basic Algebra:** Basic Set Theory and Number System, Division Algorithm, Mathematical Induction, Proof by Contradiction etc.

**Polynomials and Binomial Theorem:** Algebra of Polynomials, Partial Fraction Decomposition, Factor and Remainder Theorem, Binomial Theorem

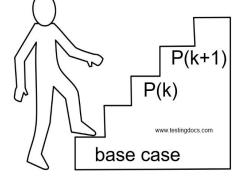
### **Functions and its Geometric Representations:**

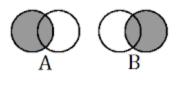
Definition of a Function, Graphs of a Function, Trigonometric Functions and some Geometric applications

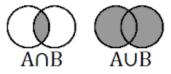
**Coordinate Geometry:** Coordinate System, Geometric Transformation (e.g., Translation and Rotation)



Mathematical Induction







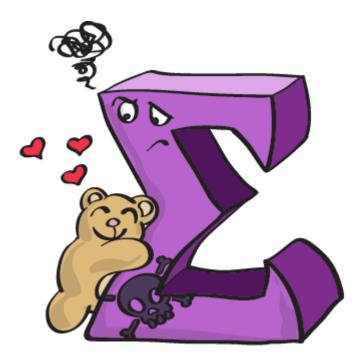


# **Brief Descriptions of Topics**

**Trigonometric Formulae:** Trigonometric Functions on the Coordinate Plane, Compound Angle Formula, Sum to Product / Product to Sum, Half Angle Formula

### **Sequences and Series:**

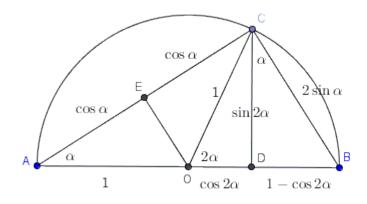
Arithmetic Sequence and Series Geometric Sequence and Series Daily Life Applications and Usage



Sum to Product Formulas



$$\sin A + \sin B = 2 \sin \left(\frac{A+B}{2}\right) \cos \left(\frac{A-B}{2}\right)$$
$$\sin A - \sin B = 2 \sin \left(\frac{A-B}{2}\right) \cos \left(\frac{A+B}{2}\right)$$
$$\cos A - \cos B = -2 \sin \left(\frac{A+B}{2}\right) \sin \left(\frac{A-B}{2}\right)$$
$$\cos A + \cos B = 2 \cos \left(\frac{A+B}{2}\right) \cos \left(\frac{A-B}{2}\right)$$

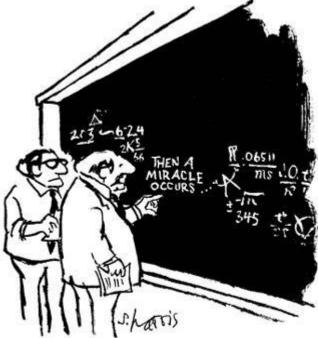


# Focus of Pre-stage Level (MATH)

Although we will have a lot of <u>computations</u> during this course, we also emphasize on the followings:

- 1. Logical Thinking and Mathematical Derivation
- 2. The appreciation of Mathematics and its extensions in our daily lives
- 3. The ways of presenting proper **mathematical proofs** and **explanations** in a more professional manner





"I think you should be more explicit here in step two."

### Screening Test (applicable for both Pre-stage and Level 1)

Online Screening Test (via Zoom) Date: 7 October 2023 (Sat)

**Time**: **11 am – 12 noon** (Student must enter prescribed Zoom meeting at 10:30 am)

Format: Multiple Choice Problems & Fill in the Blanks

### **Targets:**

- All applicants of Math Pre-stage
- Applicants of Math Level 1 who have NOT obtained Grade B or above in Math Pre-stage Level

**Closed book** test, with **NO** calculators and textbooks etc. allowed

More details are provided in the Section of "**Selection**" in the following link: https://cdgt.hkust.edu.hk/dp2023mathscreening-test





# **Any questions about CDGT MATH?**

CDGT Contact Email: cdgt@ust.hk

Contact Email of Program Coordinator (MATH): Dr. Hugo Wai Leung MAK mahwlmak@ust.hk

# Wish you ALL a fruitful learning journey at HKUST!

See you!