Lifelong Learning Program
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Six Mathematical Results with Profound Impact

Lecturer: Dr. Kevin Cheung

Schedule of Topics

The lectures are expected to cover the following topics (not necessarily in the order as they appear).

Week 1

Pythagorean Theorem

- Pythagoras and the Pythagorean community
- What the Babylonians knew
- Proofs by picture
- Ancient usage
- Diophantine equations
- Irrational numbers
- A modern connection

Week 2

Euler's Identity

- The most beautiful theorem in math?
- A "proof"
- Imaginary yet true
- The need for complex numbers
- Fundamental theorem of algebra
- An engineer's toolbox
- Quaternions and octonions

Week 3

Four-Colour Theorem

- Turning child's play into deep math
- A history of incorrect proofs
- An abstraction that is now all around us
- Do we really have a proof?
- What is a proof?

Week 4

Fermat's Last Theorem

- The margin is too small for Fermat
- Proof of a special case
- Thousands of false proofs
- Advances in algebraic geometry
- A proof that few could understand
- Mostly as easy as ABC

Week 5

Duality theorem for linear programming

- What is mathematical programming?
- Military connection
- How greedy can you get?
- Nobel Prize-worthy
- Pushing the frontiers of the travelling salesman

Week 6

Undecidability of the Halting Problem

- What is an algorithm?
- Failed attempts
- Hilbert's program
- Alan Turing's contribution
- Birth of the theory of computing
- A million-dollar question
- von Neumann architecture
- Beyond classical computers