CALCULUS (II)

Szu-Chi Chung

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Lectures

- Lecture: Szu-Chi Chung (鍾思齊)
  - Office: 理 SC 2002-4
  - Office hour: Mon. 16:00~18:00 and Wed. 16:00~18:00
- T.A.: 張朔祐、李凱偵
  - Office: 理 SC 1011-1
  - TA hour: Fri. 14:00-16:00
  - Science Table: https://sites.google.com/g-mail.nsysu.edu.tw/quality-plan/home?authuser=0
- Class hours: Fri. (09:10-12:00)
  - Classroom: エEN 4055-1
- Facebook: https://www.facebook.com/groups/1879801739418649

Textbook and requirement

- Textbook : *Calculus, 12th Ed (Metric Version)*
  - Authors: Larson, Ron and Edwards, Bruce H
  - https://www.tunghua.com.tw/portal_b10_cnt_page.php?button_num=b10&folder_id=666&cnt_id=10267
- Graphical tools
  - https://www.wolframalpha.com/
  - Mobile app – ios, or here and android or here
  - LLM
    - https://gpt.wolfram.com/index.php.zh-tw?source=footer
    - Mathos AI
    - MathGPT
  - https://writingmate.ai/blog/best-ai-tools-math

Textbook and requirement

- Resources provided by authors
  - https://www.larsoncalculus.com/calc11/
- For the odd number of exercises of each chapter, the solution is at the end of the book. Or you can find some of the video on calcview or cyber university
- Prerequisite
  - If you are unfamiliar with precalculus, read Chapter P first
    - Graphs and models, Linear models and rates of change
    - Functions and their graphs
    - Review of trigonometric functions
  - Calculus 1 - https://phonchi.github.io/nsysu-calculus1/
- The assignment and related material will be available on the course webpage
  - https://phonchi.github.io/nsysu-calculus2/

Resources

- Visual introduction to the core ideas in calculus
  - https://www.3blue1brown.com/topics/calculus
- Precalculus
  - 寫給高中生的微積分簡介-第六版
- Calculus
  - 微積分(莊重老師)
  - 微積分(李國偉老師)
  - 微積分(翁秉仁老師)
  - 微積分(朱樺老師)
  - 微積分總棟員
  - 微積分(黃文璋老師)
  - 微積分(白啟光老師)

Grading policy

- Grading
  - Weekly Homework 20%
  - Participants: 5% (participates at least 10 times can get the full score, An additional point will be awarded upon completion of the student evaluation questionnaire!)
  - Take home quiz: 5% (2 times)
  - Midterm exam: 30%
  - Final exam: 40%
- Midterm
  - Will be held on 2026/04/17 at エEN 4055-1
- Final:
  - Will be held on 2026/06/12 atエEN 4055-1

Relate to other courses

- Related courses
  - Applied Mechanics (I)(II)
  - General physics (II)
  - Engineering Mathematics (I)(II)
  - Electric Circuit Theory
  - Thermodynamics, Fluid Mechanics – Vector Calculus
  - Modern Physics
  - ….
- Related fields
  - Machine learning, statistics
  - Applied mathematics
  - …

What we are going to study in this semester

- This semester
  - Integration Techniques and Improper Integrals (8.1~8.5, 8.8)
  - Infinite series (9.7~9.10)
  - Parametric Equations and Polar Coordinates (10.2~10.5)
  - Geometry of space (11.7)
  - Vector valued function (12.1,12.2)
  - Functions of Several Variables (13.1~13.9)
  - Multiple integration (14-1~14-3, 14-5~14-7)

WolframAlpha

- WolframAlpha is a computational knowledge engine or answer engine developed by Wolfram
  - It is an online service that answers queries directly by computing the answer from "curated data", rather than providing a list of documents or web pages that might contain the answer, as a search engine might
  - WolframAlpha has been used to power some searches in the Microsoft Bing and DuckDuckGo. For factual question answering, it is sometimes queried by Apple's Siri, Amazon Alexa and ChatGPT for math and science queries
  - Can be used for math, physics, chemistry, earth science, engineering, weather, ….

Some examples you may encounter this semester

- Sequence
  - 1, 4, 9, 16, 25, ... (Sequence Recognition)
  - 1+1/2+1/3+1/4+...
  - limit (1+1/n)^n as n->infinity
- Infinite sum
  - sum (3/4)^i, i=0..n
  - sum (3/4)^i, i=0..infinity
  - sum 1/n^2 (infinite sum)
- Sum convergence
  - convergence of n^(-2)
  - sum convergence of n^(-2)
  - does the sum of 1/(n!) converge

Some examples you may encounter this semester

- Radius of convergence
  - radius of convergence of (3x-2)^n/n
- Taylor and Maclaurin series
  - taylor series sin x
  - series sin x at x=pi/4
  - series sin x to order 20
- Parametric and polar plots
  - parametric plot (cos^3 t, sin^3 t)
  - polar plot r=1+cos theta
- Arc length and area
  - length of the curve {x=2cos(t), y=2sin(t)} from 0 to 7
  - length of the curve {x=2cos(t), y=2sin(t), z=t} from 0 to 7

Some examples you may encounter this semester

- Functions of several variables
  - is 3xy^2 - x^3 a differentiable function?
  - d/dx x^2 y^4, d/dy x^2 y^4 (Partial derivative)
  - derivative of x^2 y+ x y^2 in the direction (1,1) (Directional derivative)
  - maximize x y on x^2+2 y^2=4 (Extrema)
- Multiple integration
  - integrate x^2 sin y dx dy, x=0..1, y=0..pi
  - int sin^2 x + y sin z dx dy dz , x=0..pi, y=0..1, z=0..pi
  - int e^-(x^2+y^2) dx dy, x=-∞ to ∞, y=- ∞ to ∞