# Math 2710

- Classes: Mon, Wed, Fri; 10:00-10:50. Classes start Wed Jan 21.
- Location: Mathematical Sciences Building, M-315.
- Office Hours: Mon, Wed, Fri; 12:15--1:00.
- Exams:
  - **The first midterm will be held on Friday the 6th of March. Practice questions are here.**
  - **The second midterm will be held on Friday the 17th of April. Practice questions are here.**
  - **The final exam will be held on Wednesday the 6th of May between 8:00 and 10:00AM in M-315. Practice questions are here.**
- Homework: Will be set periodically, to be handed in the following week.
- Syllabus:
  - Textbook: A Transition to Advanced Mathematics, Sixth Edition, by Smith-Eggen-Andre.
  - Outline: The purpose of this course is to introduce mathematics as a branch of philosophy, rather than simply a collection of tools for solving certain problems. The aim is to gain an appreciation of what mathematicians do and how they think. The central notion of the course will be the mathematical concept of *proof*. By the end of the course you should understand what a mathematical proof is and have some experiance with the general strategies and techniques for carrying them out. We will start by introducing the formal language that mathematicians reason and write proofs in, the language of *logic*, and the basic objects mathematicians study, which are called *sets*. We will then use this to develop a precise definition of the familiar notion of a *function*. We will use this to develop a concept of *size* for sets, including infinite sets, and use our precise framework to investigate some of the properties of infinite sets, including the presence of different sizes of infinity. We will work our way through the above textbook. The topics that I intend to cover are:
    - 1.1 Propositions and Connectives
    - 1.2 Conditionals and Biconditionals
    - 1.3 Quantifiers
    - 1.4 Basic Proof Methods I
    - 1.5 Basic Proof Methods II
    - 1.6 Proofs Involving Quantifiers
    - 1.7 Additional Examples of Proofs
    - 2.1 Basic Concepts of Set Theory
    - 2.2 Set Operations
    - 2.3 Extended Set Operations and Indexed Families of Sets
    - 2.4 Induction
    - 2.5 Equivalent Forms of Induction
    - 2.6 Principles of Counting
    - 3.1 Cartesian Products and Relations
    - 3.2 Equivalence Relations
    - 3.3 Partitions
    - 3.4 Ordering Relations
    - 3.5 Graphs
    - 4.1 Functions as Relations
    - 4.2 Constructions of Functions
    - 4.3 Functions that are Onto; One-to-One Functions
    - 4.4 Images of Sets
    - 4.5 Sequences
    - 5.1 Equivalent Sets; Finite Sets
    - 5.2 Infinite sets
    - 5.3 Countable Sets

- **Note:** This syllabus may be subject to modest alterations in content as the semester progresses.

- Assessment:
  - Homework assignments will contribute to 10% of your grade. It is important that you hand them in **on time**.
  - There will be two mid-sessional exams. The first will be worth 20% of your grade and the second 30%.
  - There will be a final exam, which will be worth 40%.

- Additional Resources:
  - Online software for implementing the Euclidean Algorithm is here.

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**Homework**

| Questions set | Due |
|---|---|
| 1.1 Q1, 4a, e, k;<br>1.2 Q2b, e, h; 4a, c, d; 5b, f; 6c; 7e; 8b, d, h, j. | Mon Feb 9th. |
| 1.3 Q1e, g, h, k; 5a, bb; 6b, c;<br>1.4 Q5b, d; 6a; 7e, f, i. | Fri Feb 20th. |
| 1.5 Q3a, g; 4b; 6a, d; 11;<br>1.6 Q1a; 2b; 5c; 7c;<br>1.7 Q1a, 6a. | Fri Feb 27th. |
| 2.1 Q1d, f; 3d, h; 4f; 5b; 6d; 8c; 9h; 17.<br>2.2 Q1b, d, j; 2h; 3g, h; 10b; 11a; 12d; 14b. | Fri Mar 20th. |
| 2.3 Q1b, d, h; 6b; 8a, d; 12a.<br>2.4 Q8c, d, h, m; 13. | Mon Mar 30th. |
| 1.7 Q8.<br>3.1 Q1d; 3d; 4b.<br>3.2 Q1b, h; 2b, e; 4a, b, j; 6d; 7e; 8; 9. | Fri Apr 17th. |

Back to homepage