

MATH 300 Fall 2018

Transition to Advanced Mathematics

Section	Schedule	Location
003	MWF 01:10 PM - 02:00 PM	Gambrell 205

Instructor: Francisco Blanco-Silva

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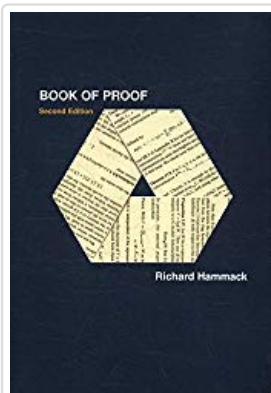
phone: 777-0283

Office: LeConte 314D

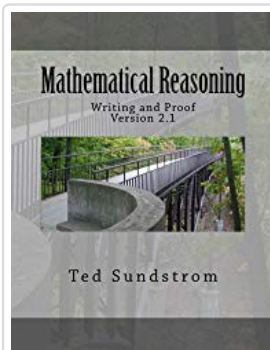
Office Hours: MW 2:20 — 3:10 PM, TTh 1:15 — 2:30 PM

Recommended Reading

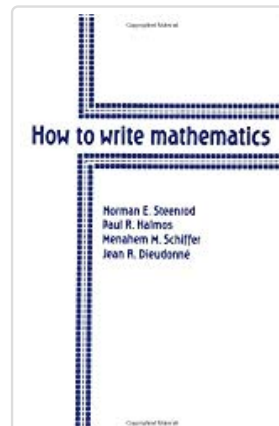
Click on each title for further information.



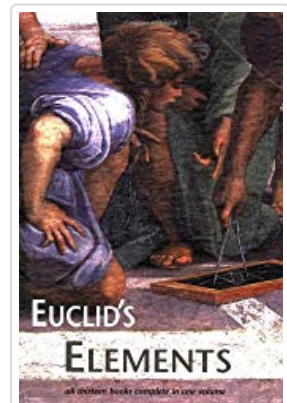
Book of Proof



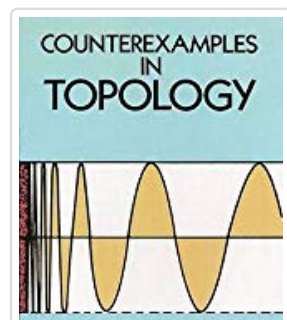
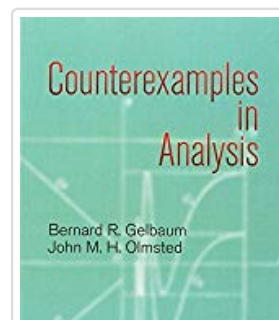
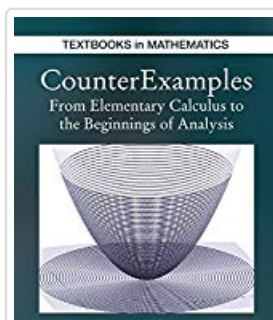
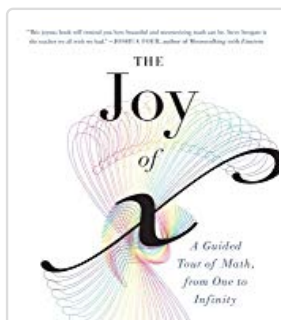
Mathematical Reasoning:
Writing and Proof
Version 2.1

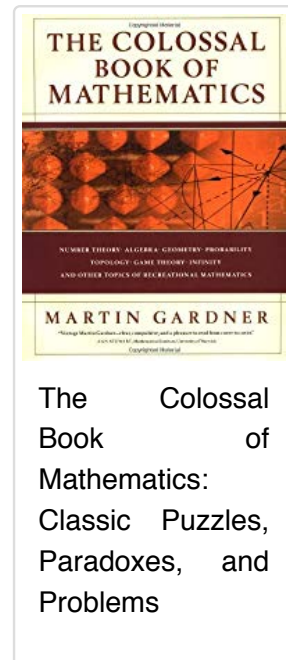
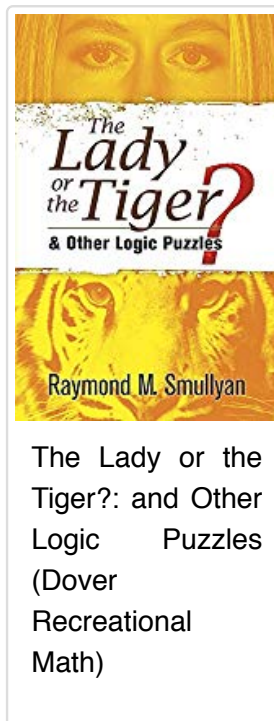
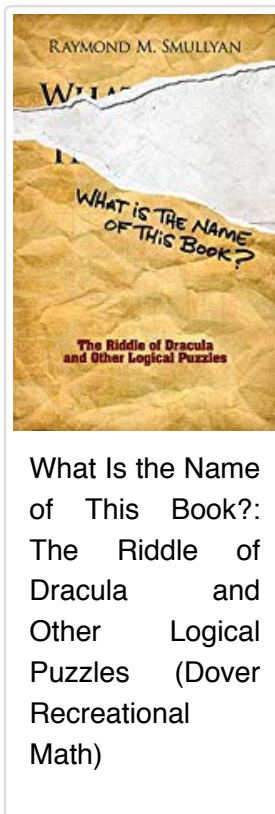
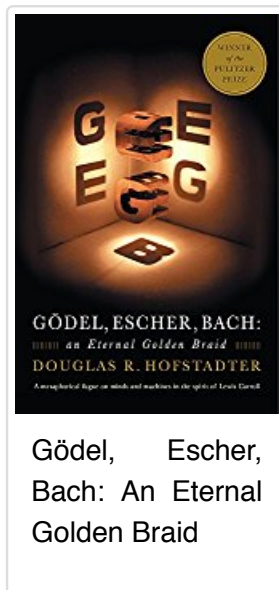
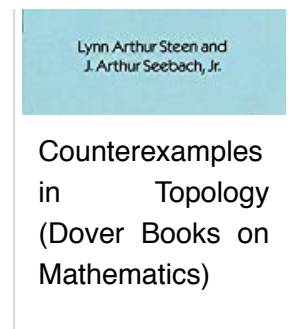
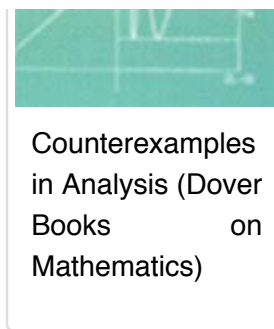
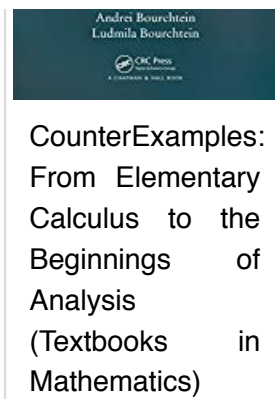
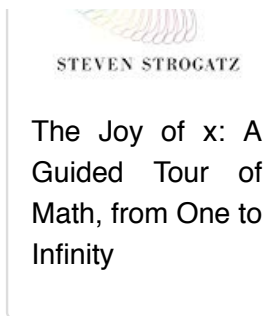


How to Write
Mathematics



Euclid's Elements





Important deadlines you need to know

General Dates

Classes begin	Aug 23, 2018
Labor Day Holiday	Sep 3, 2018
Fall Break	Oct 18—19, 2018
General Election Day	Nov 6, 2018

General Dates

Thanksgiving Recess	Nov 21—25, 2018
Last Day of Classes	Dec 7, 2018

Academic Deadlines

Last Day to Change/Drop without W	Aug 29, 2018
First Day W Grade Assigned	Aug 30, 2018
Last Day to Drop/Withdraw without WF	Oct 15, 2018
First Day WF Grade Assigned	Oct 16, 2018

Students withdrawing from courses after the WF deadline (including past semesters) must process a petition through the withdrawal website [www.sc.edu/withdrawal]

Prerequisites

Calculus II
(A grade of **C** or better in MATH 142)

...or consent from the Undergraduate Director.

Course Structure and Grading Policies

The final grade in this course will be computed as follows:

$$F = \frac{1}{5}(T_1 + T_2 + T_3) + \frac{1}{100} \sum_{k=1}^{20} HW_k + \frac{1}{40} \sum_{k=1}^8 ES_k$$

Homework Assignments

A set of problems is assigned at almost each standard lecture. There are initially 20 assignments planned.

Students are required to participate in the corresponding forum for each assignment. This is the best way to obtain hints and feedback.

Students must submit the required assignments in class, at the beginning of each week. Submissions must be presented in copy paper. They must be neat, legible, and properly stapled.

Students are encouraged to *L^AT_EX* their submissions, but this is not a requirement.

The combined scores of the HW amount to 20% of the final grade.

Exploratory Sessions

There will be eight in-class Exploratory Sessions (see Lesson Plan below for the corresponding dates).

Students are presented with an individual challenge (different assignment for different students). The individual challenge consists of one or more problems, similar to the ones posed on the assignments. Students are encouraged to use the content of their submitted assignments, as well as work in groups, to address these individual challenges.

Upon termination, each student must submit the solution to their individual challenge together with the corresponding HW assignments, if they are due on that date.

The combined scores of the Exploratory sessions amount to 20% of the final grade.

In-class Tests

There are three in-class tests, initially scheduled as follows:

- **Test #1:** Monday, October 8th
- **Test #2:** Monday, October 22nd
- **Test #3:** Monday, November 19th

Each test amounts to 20% of the final grade.

Final Exam

Students that have attended at least six Exploratory Sessions and two exams, and are unhappy with their potential final score, must notify the instructor **by email on or before Monday, November 26, before 6:00 PM**. Those students will have an opportunity to change their course grade by taking a (comprehensive) final exam. **The score of the final exam will substitute the previous grade.**

The final exam is scheduled on **Friday, December 14, at 12:30 PM**.

No make-up assignments or tests will be given. Only the following reasons are valid excuses for missing class or assignments, and must be verified by letter from a doctor, guardian or supervisor.

- Participation in an authorized University activity (such as musical performances, academic competitions, or varsity athletic events in which the student plays a formal role in a University sanctioned event)
- Required participation in military duties
- Mandatory admission interviews for professional or graduate school which cannot be rescheduled
- Participation in legal proceedings or administrative duties that require a student's presence
- Death or major illness in a student's immediate family
- Illness of a dependent family member
- Religious holy day if listed on www.interfaithcalendar.org
- Illness that is too severe or contagious for the student to attend class
- Weather-related emergencies

Students should notify faculty members at least two weeks prior to the absence when possible. In all cases, students must contact the faculty member to request an accommodation upon return to class.

The course grade will be determined as follows:

GRADE	RANGE
A	90%-100%
B+	86%-89%
B	80%-85%
C+	76%-79%
C	70%-75%
D+	66%-69%
D	60%-65%
F	below 60%

Further Information

Honor Code

The Honor Code applies to all work for this course. Students found violating the Honor Code will be subject to discipline.

Student Disability Resource Center:

If you have special needs as addressed by the *Americans with Disabilities Act* and need any assistance, please notify the instructor immediately.

Learning Outcomes

The emphasis in most upper-level courses in mathematics is the formal development of abstract mathematical ideas. The expectation at those courses is that students will be able to read and understand proofs, and be able to construct proofs on their own in a coherent, understandable way.

This course is designed to help students transition to that level. The focus is mainly:

- Development of logical thinking skills (as in gaining the ability to think abstractly in a proof-oriented setting)
- Ability to construct and write mathematical proofs using standard methods:
 - Direct Proofs
 - Counterpositive Proofs
 - Proofs by Contradiction
 - Mathematical Induction
 - Case Analysis
 - Counterexamples
- Ability to read and understand written mathematical proofs.
- Development of creative thinking and problem-solving.
- Improvement of communication in mathematics.

- Understanding the nature of mathematics and its language.

Lesson Plan

Fri, Aug 24

Review of Course content, policies, etc.

Mon, Aug 27

Sets

—Introduction to Sets

HW Assignment: Page 7. Problems 1—52

Forum for Assignment #1

Wed, Aug 29

Sets

—The Cartesian Product

HW Assignment: Page 10. Problems 1—20

Forum for Assignment #2

Fri, Aug 31

Sets

—Subsets

—Power Sets

HW Assignment:

—Page 14. Problems 1—16.

—Page 16. Problems 1—20

Forum for Assignment #3

Wed, Sep 5

(Assignments #1—3 due today)

Sets

—Union, Intersection, Difference

—Complements

—Venn Diagrams

HW Assignment:

—Page 18. Problems 1—10

—Page 20. Problems 1—6

—Page 23. Problems 1—11

Forum for Assignment #4

Fri, Sep 7

Sets

—Indexed Sets

HW Assignment: Page 28. Problems 2—4,6—8,10—14

Forum for Assignment #5

Mon, Sep 10

Exploratory Session

(Assignments #4,5 due today)

Wed, Sep 12

Logic

—Statements

HW Assignment: Page 37. Problems 1—15

Forum for Assignment #6

Fri, Sep 14

Logic

—And, Or, Not.

HW Assignment: Page 41. Problems 1—14

Forum for Assignment #7

Mon, Sep 17

Exploratory Session — The Lady or the Tiger?

(Assignments #6,7 due today)

Wed, Sep 19

Logic

—Conditional Statements

—Biconditional Statements

HW Assignment:

—Page 44. Problems 1—13

—Page 46. Problems 1—5

Forum for Assignment #8

Fri, Sep 21

Logic

—Truth Table for Statements

—Logical Equivalence

HW Assignment:

—Page 48. Problems 1—11

—Page 51. Problems 1—14

Forum for Assignment #9

Mon, Sep 24

Exploratory Session — Knights and Knaves
(Assignments #8,9 due today)

Wed, Sep 26

Logic
—Quantifiers

HW Assignment: Page 53. Problems 1 — 10

Forum for Assignment #10

Fri, Sep 28

Logic
—Translating English to Symbolic Logic
HW Assignment: Page 57. Problems 1 — 13

Forum for Assignment #11

Mon, Oct 1

Exploratory Session
(Assignments #10,11 due today)

Wed, Oct 3

Logic
—Negating Statements
HW Assignment: Page 60. Problems 1 — 12

Forum for Assignment #12

Fri, Oct 5

Direct Proofs
—Theorems
—Definitions
—Introduction to Direct Proofs
No HW today

Mon, Oct 8

Test #1. Sets, Logic
(Assignment #12 due today)

Wed, Oct 10

Direct Proofs
—Further Insight into Direct Proofs

—Using Cases

HW Assignment: Page 100. Problems 1—28

Forum for Assignment #13

Fri, Oct 12

Direct Proofs

—Further Insight into Direct Proofs

No HW today

Mon, Oct 15

Mathematical Writing

No HW today

Wed, Oct 17

Exploratory Session

(Assignment #13 due today)

Mon, Oct 22

Test #2.

—Direct Proofs

Wed, Oct 24

Contrapositive Proofs

HW Assignment: Page 110. Problems 1—17

Forum for Assignment #14

Fri, Oct 26

Proofs by Contradiction

HW Assignment: Page 118. Problems 1—24

Forum for Assignment #15

Mon, Oct 29

Exploratory Session

(Assignments #14,15 due today)

Wed, Oct 31

Proving Non-Conditional Statements

—If-and-Only-If Proofs

—Existence Proofs

—Existence and Uniqueness Proofs

Fri, Nov 2

Proofs Involving Sets

- How to prove $a \in A$
- How to prove $A \subseteq B$
- How to prove $A = B$

Mon, Nov 5
Exploratory Session

Wed, Nov 7
Disproof
—Counterexamples
—Disproving Existence Statements

Fri, Nov 9
Mathematical Induction
—Proof by Strong Induction

Mon, Nov 12
Exploratory Session

Wed, Nov 14
Mathematical Induction
—Proof by Smallest Counterexample

Fri, Nov 16
Review for Test #2

Mon, Nov 19
Test #2.
—**Contrapositive Proof**
—**Proof by Contradiction**
—**Proving Non-Conditional Statements**
—**Proofs Involving Sets**
—**Disproof**
—**Mathematical Induction**

Mon, Nov 26
Relations
—Properties of Relations

Wed, Nov 28
Relations
—Equivalence of Relations
—Equivalence Classes and Partitions

Fri, Nov 30

Functions

Mon, Dec 3

Functions

—Injective and Surjective Functions

Wed, Dec 5

Functions

—Inverse Functions

Fri, Dec 7

Cardinality

—Sets with Equal Cardinalities