

# Math 4023, Introduction to Modern Analysis

## Course Information

Dr. L. Mantini  
Summer 2011

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**Course Times:** MTWR 10:30–11:45 AM in HES 029.

**Office Hours:** I am available from 11:45–12:15 PM daily, after class, and MTW 1:30 – 2:30 PM. Other times are available by appointment.

**Course Objectives:** The aim of this course is to revisit our study of calculus from a theoretical viewpoint. Many of the definitions and proofs we will study became necessary because mathematicians discovered that, without rigorous definitions and careful proofs, numerous paradoxes and contradictions arose! Our goals are to

- develop a rigorous understanding of convergence, continuity, derivatives, and integrals, to complement the intuition that you gained in your prior courses;
- refine and improve your ability to read and write mathematical proofs and to develop a feeling for why they are so essential in mathematics.

**Prerequisites:** The prerequisites for this course are Calculus I, II, and III (OSU's MATH 2144, 2153, and 2163) and Introduction to Modern Algebra (MATH 3613) or another course in which you have learned to read and write proofs. Anyone without prior experience in the reading and writing of proofs should speak to me after class.

**Text:** The text is *Analysis: With an Introduction to Proof*, fourth edition, by Steven R. Lay. For those with little experience in techniques of proof, I recommend the text *How to Prove It: A Structured Approach* by Daniel Velleman as a supplement.

**Course Requirements:** Students enrolled in section 001 for **undergraduate credit** will complete the following requirements:

- Three exams worth 150 points each, scheduled for 10:30 – 11:45 PM on
  - Thursday, June 23;
  - Wednesday, July 13;
  - Thursday, July 28.
- Homework worth 150 points, collected in 8 assignments worth 20 points each (10 bonus points are built in). In this homework schedule, one assignment is equivalent to about 1.5 assignments during a regular semester.
- A small number of bonus points may occasionally be available from in-class activities, pop quizzes or other assignments. Pop quizzes may be designed to test that you read the assigned sections of the text. Bonus points cannot be made up.

Students enrolled in Section 01G for **Graduate Credit**, or students enrolled in Section 001 who wish to earn **Honors Credit**, will also complete:

- One additional homework assignment, worth 20 points;
- Additional problems on the final exam which test the material in the extra assignment, worth 50 points. A possible allotment of extra time for these problems will be discussed closer to the date.

**Grading:** The maximum total points for those earning non-honors undergraduate credit is 600. Preliminary grade cutoffs are:

- 540 points (90%) guarantees an A in the course;
- 480 points (80%) guarantees a B;
- 420 points (70%) guarantees a C;
- 360 points (60%) guarantees a D.

The maximum total points for those earning honors or graduate credit is 670. Preliminary grade cutoffs are:

- 603 points (90%) guarantees an A in the course;
- 536 points (80%) guarantees a B;
- 469 points (70%) guarantees a C;
- 402 points (60%) guarantees a D.

**Homework:** Homework is assigned from every text section we cover. It is collected approximately every 3 summer school classes, so that one assignment is collected every week. Each assignment is about 1.5 times the length of an assignment that would be given during a regular spring or fall semester. Selected problems will be graded and the assignment returned as soon as possible. Solutions to all problems on the assignment will be posted on our course's D2L page. You have two free "late" days that may be used during the semester (one assignment 2 days late, or 2 assignments 1 day late). After that, each day a homework assignment is late results in a deduction of 7 points from your score. Homework rules:

- Leave homework on a pile on the table as you enter class on the day it is due;
- Prepare your homework on 8.5" by 11" sheets which are **stapled** and with **no ragged edges**.
- Label each problem with the *complete* problem number, written as 11.5 for problem 5 from section 11, in the **left margin**.
- Write clearly in full, grammatically correct English sentences. Partial credit is not guaranteed.

**Makeup exams:** Makeup exams will be given only for very serious and unavoidable extenuating circumstances and **only** if you notify me before or as soon as possible after the missed exam.

**Drop Policy:** The last day to drop the course with a partial fee refund is Friday, June 10. The last day to drop the course with an automatic grade of W is Friday, July 15. Your first two exams will be returned before this date. The last day to withdraw from all classes with an assigned grade of W or F is Friday, July 22.

**Attendance Policy:** Attendance is not a part of your course grade, but it is **very highly recommended**. You are responsible for all material covered in class and all assignments. There is a strong correlation between poor class attendance and low grades. For part of the summer, one of our students will be traveling, so recordings of our class sessions will be available on our D2L page. Those recordings will be available as an extra study tool to all students, but they are not meant to replace class attendance.

**Academic Integrity:** Oklahoma State University is committed to the maintenance of the highest standards of integrity and ethical conduct of its members. This level of ethical behavior and integrity will be maintained in this course. Carefully read the OSU policy at [academicintegrity.okstate.edu](http://academicintegrity.okstate.edu).

With regard to the homework in this course, you should note that I encourage the formation of study groups and the discussion of homework solutions. However, you must write up your homework solutions *yourself*. The following are not permitted:

- Showing your written homework solutions to another student;
- Reading another student's written homework solutions;
- Writing a solution to a homework problem jointly with another student and then both students copying that solution onto their own papers;
- Reading homework solutions written by faculty or students in other semesters and/or at other universities, including such solutions posted on the internet or in the instructor's manual.

**Study Hints:** This course is difficult but students all over the country succeed in this course every semester, and you can too. Here are some helpful resources:

- Read the book thoughtfully, trying to work things out with pencil and paper. Do this before class if you have trouble keeping up with my lectures. Try the practice problems. Look for specific examples that illustrate the definitions and theorems.
- Start homework early and work on it frequently rather than in long, marathon sessions. This gives your brain a chance to have some "Aha!" moments.
- Check the homework hints and partial solutions in the back of the text. Carefully go through my posted solutions when I return assignments to you.
- Form a study group, or come to talk to me about the material.
- Take responsibility to do what it takes to succeed. In a course like this, with a theoretical leaning, sometimes you have to be more pro-active.
- I will try to find someone tutoring at the MLRC who might be comfortable helping you — I'll let you know if I find someone.

**Math 4023 Homework List, Summer 2011:** Remember to read the examples in the text, do the practice problems in the text, and answer the true-false questions at the beginning of each section. Problems marked with an asterisk are important enough that they are used later in the text; problems marked with a star have hints or answers in the back of the text.

Prob. Set	Due Date	Sections	Problems assigned
1	6/9	1 2 3	4 c–e, 6, 8, 10 d–h, 12 4, 6 a–c, 8, 10 a–d, 14, 15, 16 3, 4, 6 b, d, g, i, k; 7 c–f; 8, 10
2	6/15	4 5 6	4, 10, 11, 16, 18, 19, 22 4, 5, 6, 10, 15, 23, 25 8, 10, 11 b, d, f–h; 14, 18, 19
3	6/21	7, pp. 60–64 7, pp. 65–71 10	3, 5, 6, 7 (prove (b)), 9, 10 13, 14, 15 a–b, 16 a–b, 19, 22, 26 4, 6, 15, 17, 21
Exam 1	6/23	covers problem sets 1–3	
4	6/29	8 11	3, 4, 5, 6, 10, 16, 17, 22 3 b–d, 4, 6, 7, 11
5	7/6	12 13	3 (2nd col), 4 (2nd col), 5, 8, 9, 10, 12 3, 4, 5, 6, 11, 14, 20 a–b, 21 c–e
6	7/12	14 16	3, 4, 5, 8, 9 3, 6, 7 c–e, 8 a–b, 9, 10, 12, 15
Exam 2	7/13	covers problem sets 4–6	
7	7/20	17 18 20	3, 4; 5b, d, f; 6, 7, 15, 18 3 b–d, 4, 5, 10 3 d–h, 6, 7, 9, 16
8	7/26	21 22 25	3, 4, 8, 9, 10, 13 3 a–b, e–g; 5, 7, 9, 14a 3, 4, 6, 7a, b, d; 9, 11
HG (Hon/Grad credit)	7/28	23 26 29	3a, b, f, g; 4 a–b, 5, 10, 11, 13 4, 5a, c, f; 6, 8b, 9, 17 4, 6, 7, 10, 12
Final Exam	7/28	Comprehensive, emphasizes problem sets 7–8 Includes asn. HG for Honors or Graduate credit	

**Tentative Calendar:** The following is a tentative calendar for our course. Discussion threads leading to a Problem Set are shown in the same style type. Within a thread, I may intermingle the text sections, moving some topics forward, finishing others up a day or two later.

Week of	Monday	Tuesday	Wednesday	Thursday
June 6	Sec. 1–2	Secs. 2–3	PS 1 quest. <i>Sec. 4</i>	PS 1 due <i>Sec. 5</i>
June 13	<i>Sec. 6</i>	Sec. 7 <i>PS 2 quest.</i>	Sec. 7 <i>PS 2 due</i>	Sec. 10
June 20	PS 3 quest. <i>Sec. 8</i>	PS 3 Due <i>Secs. 8, 11</i>	<b>REVIEW</b> <b>PS 1–3</b>	<b>EXAM 1</b>
June 27	<i>Sec. 11</i>	Sec. 12 <i>PS 4 quest.</i>	Sec. 12–13 <i>PS 4 due</i>	Sec. 13
July 4	<b>HOLIDAY</b>	PS 5 quest. <i>Sec. 14</i>	PS 5 Due <i>Secs. 14, 16</i>	<i>Sec. 16</i>
July 11	Sec. 17 <i>PS 6 quest.</i>	<b>REVIEW</b> <i>PS 6 due</i>	<b>EXAM 2</b>	Sec. 18
July 18	Sec. 20	PS 7 quest. <i>Sec. 21</i>	PS 7 Due <i>Sec. 22</i>	<i>Sec. 25</i>
July 25	Secs. 26, 29 <i>PS 8 quest.</i>	<b>REVIEW</b> <i>PS 8 due</i>	<b>REVIEW</b>	<b>FINAL EXAM</b> PS HG due