

MATH 301: Real Analysis I

Mathematics Department, Bryn Mawr College, Fall 2017

Professor: Victor Donnay	Lecture: MW 2:40 – 4:00 pm Rm. 336
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TA Session: Tuesday 7 - 8:30 pm
Thursday tbd.

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Pre-requisites: The pre-requisite for the course is Math 201 (Multi-variable calculus). Math 203 (Linear Algebra) and Math 206 (Transitions) are strongly recommended. We will be studying material that you (might) have seen in Calculus (Math 101, 102 and 201). In those courses, the focus was on how to do various types of problems. In Real Analysis, the focus is on understanding the underlying ideas of calculus using formal mathematical reasoning.

Texts: Understanding Analysis: 2nd Edition by S. Abbott. We will be covering material from Chapters 1- 4.

Course Web Site: accessible from [Prof. Donnay's homepage](#),

Materials for the course will be found primarily on the web site; some materials will be posted on the course Moodle site. HW assignments will be posted on the [Play-by-Play page](#) as well as brief summaries of each class.

TA: There will be regular TA sessions for the course. My expectation is that you will attend the TA sessions regularly. **The problems I assign are challenging and I do not expect students to be able to complete all the homework unless they attend the TA sessions.**

Learning Goals of the Course: In this course, you will:

Learn to communicate your mathematical reasoning in writing and verbally, both via informal arguments and via more formal proofs. Math 301 is a writing attentive course (see below).

Develop your ability to work as an independent and self-sufficient learner:

What to do when you do not know what to do

How to take what you have learned in one situation and apply it to a new and different situation (transfer of knowledge)

Get comfortable with not knowing the answer immediately

Learn material we have not covered in class by reading the book and applying this newly learned information to solve problems

Decide for yourself whether you understand material and learn how to ask yourself questions to check your understanding

Become part of a community of learners who support, encourage and learn from one another.

Learn the key concepts of calculus including:

- countable and uncountable sets
- sequences and limit of a sequence,
- open and closed sets,
- series
- continuity of a function,
- conditions which insure the existence of a maximum (or minimum) of a function,

You will demonstrate your mastery of this material by:

- knowing the definitions of these key concepts and the statements of the main theorems associated with them,
- giving examples which illustrate these definitions and theorems,
- giving rigorous mathematical proofs employing these concepts.

Writing Attentive Course: Math 301 is a writing attentive course in which you will gain practice in writing appropriate for mathematics. The writing will involve homework problems, quizzes and exams. There will be opportunity for rewrites and resubmission of some of the writings.

Much learning happens by trying, doing as much and as well as you can, then getting feedback and trying again. So each week you will revise and resubmit at least one HW problem from the previous week. If you like, you may revise and resubmit a second problem too.

Much learning happens by trying, doing as much and as well as you can, then getting feedback and trying again. **So each week you will be asked to revise one HW problem from that week's assignment (if there is a problem you have not mastered) and resubmit. These revisions will always be due the Tuesday after you have gotten the HW back.** This rewriting process is a great way to improve one's writing skills!

Exams:

There will be two mid-term exams and a final exam. The *tentative* schedule for the Mid-term exams is:

Mid-term 1 in the 6th week (Oct 9 - 13th)

Mid-term 2 in the 1 week of (Nov.27- Dec 1).

Homework:

Homework will be assigned each week, usually after each class. The homework will be due on Fridays. Occasionally I will ask you to do a short assignment for the following class period.

You are allowed **two** late homework assignments without penalty. The late homework is due the following class.

Assignments and summary of topics covered are contained in the [Play-by-Play page](#).

The homework problems will be assessed as one of either:

- **Mastery (M)**: demonstrates complete understanding
- **Near Master (NM)**: mastery except for minor mistakes
- **Developing (D)**: parts of the problem are correct but there are also significant parts of the problem that are not yet correct.
- **Not Yet (NY)**: very little of the problem is correct

After you have used up your quota of late homeworks, additional late homeworks will be assessed a penalty: 25% deduction if one class late, 50% deduction if two classes late, 75% deduction if 3 classes late; **not accepted after that point**.

You are welcome to work with other students on the homework. Talking together and explaining your ideas to each other is a great way to learn. When you write up your final answers, you should do that yourself. You should not copy someone else's write up.

On the top of the first page of each homework you submit, you must indicate the people you worked with. Giving such acknowledgement is standard scientific practice. Here is how to do it:

On this assignment, I discussed the material with (list the people including the TA and Prof Donnay if relevant).

The best way to learn mathematics is by doing. At this level of more theoretical mathematics, problems can take a lot of thought and experimentation to complete. Part of the goal of the course is to help you develop strategies to attack these hard problems (draw pictures, make simpler mini-problems, read the text very carefully, discuss with your classmates).

Quizzes: There will be a short take home quiz each week. It will cover the basic material that we have covered in the previous week's homework. The quizzes will be due in class on Mondays; it will cover material from the HW that was handed in the previous week. The quizzes will be assessed Mastery (M), Developing (D), Not Yet (NY). If you do not demonstrate mastery on the first try, you can redo. The goal is for you to learn the material. **Persistent** is a key trait for success in all endeavors; if you are willing to keep working at it, I am pleased to support and encourage your efforts by giving you multiple chances to demonstrate mastery.

Math Culture Requirement: During the semester, you will attend at least two math events (departmental colloquium, student panels, MAA conference) and write one page reflection papers about each event. The goal of the reflection paper is to describe what you thought about the event, what ideas you found interesting, what connections you noticed between the presentation and things you have learned in math. These reflection papers are not meant to be a summary of what the speaker said. You will post your reflection papers on the course Moodle site. **The paper is due within one week of attending the math event.**

The first reflection paper is due by Friday Oct 27th; the second by Friday Dec 15th.

Classroom:

During class, there will be a mixture of lecturing by the professor and time spent by the students working out problems, discussing their results in groups and having whole class discussions. [Research](#) has shown that this type of active participation leads to improved learning.

We will occasionally use Excel or Mathematica during class time, but no previous computer experience is assumed.

The group work does not go well when members of the group are absent. Therefore it is important that you attend to class. Please be respectful of your fellow students. If you decide to take this course, you must commit to attending class regularly.

Final grades will be determined using the following percentages:

Homework, Quizzes, Class participation	20%
Midterm 1	25%
Midterm 2	25%
Final Exam	30%
Total	100%