Theory of Differential Calculus

Syllabus

Fall 2021 | **Subhadip Chowdhury** | **Math 115**

Course Info

- **Section 01:** MWF 9:00 am - 9:50 am, T 8:00 am - 9:20 am (EST)
- **Section 02:** MWF 10:00 am - 10:50 am, Th 8:00 am - 9:20 am (EST)

Instructor Info

- **Instructor:** Subhadip Chowdhury
- **Email:** schowdhury@wooster.edu
- **Office:** Taylor 307
- **Office Hours:** See Moodle.

Zone Interns

- **Sec 01:** Melita Wiles (mwiles22@wooster.edu)
- **Office Hours:** Thursday, 8-10 PM
- **Sec 02:** Rekik Ziku (rziku23@wooster.edu)
- **Office Hours:** Tuesday, 8-10 PM

§A. Prerequisites

This course is a continuation of MATH 110 - Applied Differential Calculus. A grade of C- or better in 110 (or an AP/equivalent credit), including a firm understanding of algebra and Caclculus 110 topics, is required for this course. If you have any concerns regarding your preparedness level for this course, please speak with me as soon as possible.

§B. Learning Goals

Math 115 Specific Goals

Together with Math 110, this course is the equivalent of a typical first-semester course on differential calculus. We re-tread many of the same concepts from Math 110, but will fill in gaps from that course, ultimately spending more time discussing the key ideas and concepts behind the Calculus. There will be more emphasis on your ability to perform algebraic steps in computations, however, our main goal will always be to explain one's mathematical reasoning. Being able to explain complex ideas and build critical thinking skills are the primary learning goals of this course, and we hope to do so through the conduit of differential calculus.

By the end of the course, you will be able to

- Understand analytical concepts of limit and continuity and give algebraic justification for your work.
- Explain the concept of the derivative as a limiting process in graphical and analytical contexts.
- Expand your toolkit of differentiation rules for important classes of functions such as polynomials, rational functions, exponential & logarithmic functions, trigonometric functions, and inverses of functions.
- Derive & justify the different rules of differentiation.
- Perform implicit differentiation to solve related rate of change problems.

- Understand the relationship between the graph of a function and the function's derivatives.
- State the Mean Value Theorem and apply it to solve various Calculus problems.
- Explain and apply L'Hopital's rule to evaluate limits and compare growth of functions.
- Solve geometric and applied optimization problems using a variety of Calculus techniques.

Lifelong Skills

Here are some big picture goals I have for you over the course of the semester. I am also always interested in any additional goals you have for yourself and how I can help you meet those.

- Students will successfully communicate mathematics through reading, writing, and speaking.
- Students will value peer collaboration and group learning while continuing to maintain a sense of self-motivation and personal understanding.
- Students will work to solve difficult problems and value the process of figuring them out, rather than just searching for "the answer."
- We will all have FUN learning calculus together!

§C. Required Materials

Textbook

There is no one specific textbook for this course. We will be mostly following the materials from the following two open source **free** online Calculus books.

- **Calculus - Volume 1** by OpenStax. You can view a pdf or interactive E-Book here: https://openstax.org/details/books/calculus-volume-1.
- **Active Calculus** by Matthew Boelkins. You can view a pdf or interactive E-Book here: https://activecalculus.org/ACS.html.

You may choose to use either of the above as a reference. Daily class notes/worksheets will be posted on Moodle to summarize regular lectures.

Graphing Utility


You do not need a graphing calculator, and we will not use them in the class. Instead, we will use the website and app called Desmos.

This is a free, easy-to-use graphing utility. I will often utilize the website in class, and I encourage you to download the app on a phone or tablet device for your own use. If we were going to have in-class exams this semester (we won't be - more on that further down), then I would even allow you to use Desmos for exams! But I guess you can just use it anyway, regardless!

> **Note:** Any calculator that can perform symbolic manipulation (such as the TI-89, TI-92, and TI-CAS) will not be allowed for tests. In general, please be aware that providing a final answer without enough supporting work or reasoning will receive no credit.

EDFINITY

- **What is Edfinity?** Edfinity is an online homework system. To meet the needs of all students in a fair, equitable, and safe way, we will be using Edfinity for most homework assignments this semester. You will access your Edfinity assignments through Moodle and you can see more info on the Edfinity Homework tab on our Moodle course page.
- **How do I use Edfinity?** **Do not create an account on the Edfinity website directly**, as it needs to be connected to your Moodle account. When you select an assignment here in Moodle, a new window will open taking you to the assignment on the Edfinity site. You will never need to access the Edfinity website directly without going through Moodle.

The very first time you open an Edfinity assignment from Moodle, you will be prompted to enter your access code. You will need an access code to register for the course on Edfinity. These cost $25. You can purchase one directly from the Edfinity site or from the Wilson Bookstore. If you are using financial aid to purchase books, then you must purchase the access code from the bookstore. Any student who is in need of financial assistance outside of your own financial aid should contact the Dean of Students Office, dos@wooster.edu.

§D. Technology and Communication Expectations

- **Moodle.** Our course website can be reached directly through this link. Look for "Theory of Differential Calculus, 2nd Half FA21 Metacourse (MATH-11500-MC)" in your dashboard. Consider Moodle the central location for all aspects of our course. **Always check their first**.

> **Note:** The **Metacourse** in the title of the Moodle page means that it is a combination page for both Math 115 Section 01 and Math 115 Section 02. Logistically, it is much easier to maintain and update one Moodle course for both sections than to always post the exact same thing twice on an almost daily basis. I have hidden the single Moodle pages for your respective sections, so there will never be a problem with you being in the "wrong" Moodle course.

- **MS Teams.** Our Microsoft Teams page (also a Metacourse) will be the place for quick chats and online office hours.
- Please make sure that you have access to the following technological equipment.
  - **A laptop or tablet device**.
  - **A modern web browser**.
  - Reliable access to high-speed **internet**.
  - An active **MS Office account** through your **wooster.edu** access, so that you can access email, Moodle, and MS Teams.

> **Note:** All the technology we use in this course is intended to enhance our learning. If you foresee troubles with this, the sooner I know, the better I can help; so please do not hesitate to discuss this with me.

- It is imperative that you maintain awareness of course announcements and other communications at all times. **Each student is expected to check their email and Moodle announcements at least once per day and preferably more than once.** All important information will be pushed to you as soon as possible; it's your responsibility to check messages regularly and act on the information. "I didn't see the announcement" will not be accepted as an excuse!

- The best way to contact me outside of class is by email or via chat in MS Teams. I will typically only check email and other messages **between 9am EST and 9pm EST on weekdays and sporadically on weekends**. If you send a message that needs a response during those times, you can expect to get a response within about 2 hours. Otherwise you can expect one when I am back online.

- For any private communication regarding this course, please email me from your wooster.edu email address. This is mainly for identity verification purposes.

§E. Getting Math Help

My Office Hours

Please come see me during my office hours if you have questions or just want to discuss something from class. These will be most effective if you have spent some time formulating your questions beforehand - often you will answer your own questions during that process! You can also contact me via Email or MS Teams with your questions. See the communication expectations section above (section D) for my 'business' hours!

See Moodle for office hour times and further instructions.

The Math Center

Free help in this course is offered via the Math Center. See their website for their schedule. You may not need assistance all the time, but when you do, a helpful tutor can assist you and help you get unstuck!

STEM Zone Interns

During most Friday classes, your zone intern will be available for help during class-time. They will assist with problem sessions, AEPs and other assignments much in the same way as me: by answering questions and providing guidance. The main role of a zone intern is to be a peer-tutor and mentor to help strengthen your understanding of the course material. Your zone intern will hold their own office hours within the math center. Your section's ZI and contact info is listed in the first page. Their office hours in the Math Center will be posted on Moodle.

§F. Academic Policies, Procedures & Support Services

Please see the pdf document titled **Academic Policies, Procedures & Support Services** on Moodle for college policies, community guidelines, and other support services offered by the college.

§G. Syllabus Changes

I reserve the right to make changes to this syllabus, if needed. Any changes will be announced to the class in a timely manner.