

# Calculus I Syllabus

I want you . . .

1. *to be successful.* My top goal in teaching this course is to see you be successful. By “successful,” I mean that you will **grow** considerably as a learner of mathematics, **demonstrate** deep personal understanding of the main content in the course, **solve** challenging problems independently or with modest support, considerably **improve** your oral and written communication skills, and that you will go on to **achieve** similar successes in subsequent courses with 15 as a prerequisite.
2. *to be an active, caring, and productive contributor* in our Math 15 learning community.
3. *to improve in your ability to learn independently* through reading the text on your own, watching selected videos, working with peers in class on group activities, and solving challenging problems with new components.
4. *to be willing to struggle.* Struggle - temporary failure - is an important part of learning mathematics. Or anything. Part of answering hard questions involves trying and failing. Part of learning involves making mistakes and understanding why they are mistakes. The best kind of struggle is productive struggle: productive struggle pushes us further down the path of understanding and often provides new ideas that are key to making progress. Work to have a growth mind-set and challenge yourself to always get better through your work.
5. *to enjoy the course.* You may have had previous experiences with mathematics that were frustrating to you, ones that made you think that you don’t like mathematics. Especially if that is the case, I want you to have a good experience in this one and to find learning calculus interesting, satisfying, and yes, enjoyable.
6. *to build conceptual understanding* of the topics we study from several perspectives so that you gain greater ability to apply ideas in new settings, deepen your logical reasoning skills, and build an appreciation for the beautiful connections present in the mathematics of calculus. Throughout the course, I urge you to ask yourself questions like “What is the big idea here?,” “What do these symbols mean?,” “Do the concepts we are studying make sense to me?”
7. *to grow in your written and oral communication skills.* Through regularly assigned work throughout the course, you will be expected to communicate your thinking in writing. Moreover, in all of your written work, correct notation is essential. In addition, through opportunities to discuss material with your peers and contribute to whole-class discussions, you will have the chance to grow in your oral communication of mathematical ideas.

## What is Calculus?

Many real world processes can be modeled using functions. Calculus is the mathematical study of how these functions change. Sometimes we study change in abstract contexts, but often in the setting of physical phenomena in the world around us. In both settings, we’re frequently interested less in how much of a quantity there is, and rather more interested in understanding how that quantity is changing. Is it growing? Is it shrinking? Is it doing so quickly or slowly? If I change one thing, how will it change something else? Another way to think about this is that in the past you might have studied numbers and now we want to study the functions that give rise to numbers. Calculus provides us with language and tools – the derivative and the definite integral – to study important questions like these.

## Course Structure

Almost every design choice for this course is based around the following three evidence based learning methods:

- Active learning: The most productive time spent is time spent doing math, not observing it.
- Descriptive feedback: You will receive lots of feedback from me and your peers all semester to help guide your efforts.
- Meta-cognition: Thinking about how you are thinking has been proven to be an essential part of any effective learning.

### Text: Active Calculus

We will be reading and working through *Active Calculus*, by Matthew Boelkins. You can access the text for free in electronic format from <http://activecalculus.org/ACS.html>. You are expected to read the text. In fact one of the goals of this course is to learn how to properly read a math textbook and I will support you in this endeavour. The core content of this course will be completing all of the activities in this book.

### Advice from past students

- It is really important to dive into the concepts conceptually. Just understanding how to do the problems will not suffice in this course, especially if you want to continue with your maths career.
- Take the time to really understand what you're reading in the textbook, rather than rushing through it. If you rush through it at first, you'll just have to go back and take even more time to understand it.
- Talk through all of the concepts a lot, because it can be very abstract.
- Refer to multiple different sources to understand a topic you are not sure about.
- GO TO OFFICE HOURS. Professor Van Meter is always available to help and just chat about math. From how to do a problem to different geometric and algebraic interpretations of problems to just what your math future looks like.
- Always reach out to the professor if you're having trouble. Getting behind in terms of content or assignments only gets worse if you don't let them (the professor) help you.
- Have a growth mindset, and if not, learn about a growth mindset.
- I would definitely recommend this class, as it has a lot of work but you learn a lot and you have lots of support.

### Course Assessment

I am not joking when I tell that my primary goal is for you to be successful and learn. An essential part of that process is for you to give yourself real challenges, overcome your unique obstacles, and ultimately achieve your own personal goals. Because of this, and because traditional evaluative grading has been shown to inhibit learning, grades for this course will be determined by student self evaluations in consult with the professor. More formally, I will ask you to write an extensive reflection at the end of the course in which you assess your achievements and assign yourself a grade. I reserve the right to modify this grade but that has almost never been required. I have found that through continuous conversation throughout the semester students have much more insight than myself (let alone an exam) for what they have achieved.

## **Types of assignments in this course**

### **Pre-class activities**

Before each class, in addition to having read the section we will cover, you will complete some pre-class activities to help you engage with the material. By reading through the section and engaging with it by answering some question you will be ready to ask the deeper more important questions when working with your peers and myself. *See the daily prep for exact assignments for each day.*

### **During and after class**

We will spend the majority of class time working in small groups on activities from the book. This will allow you to engage with the most challenging part of learning mathematics, productive struggle, with the support of me and your peers. After class you will finish anything we were not able to in class and then begin working on the next section.

### **Weekly meta-cognition assignments**

In addition to the core “math content” of Calculus we will learn many meta-cognition skills such as developing a growth mindset, building efficient study habits, and thinking critically about the learning process. This will largely be done via weekly written meta-cognition assignments. *See the course website for details on these meta-cognition assignments.*

### **Weekly self assessment exercises**

Frequent feedback is essential to quality learning. Each week you will complete a few more formal assessment questions that you will complete alone. These questions will help you assess how well you have mastered the material from the previous parts of the course. These assessment will help you keep track of your progress and give evidence for your self evaluation at the end of the semester.

### **Optional additional webwork and challenge problems**

Different students work at different paces and have individual needs for different topics. To support this diversity I will be offering additional optional assignments. Some of these will be on WebWork and they will give you more practice with the content from the text and some will be handwritten to explore those topics more fully. You should complete these assignments if you are needing more practice or have additional time each week to more fully master the material.

### **A note about due dates**

Due dates are not a punishment, they are an organizational tool. I assign due dates so that work does not pile up, so that students have a regular feedback cycle, and to keep the class on roughly the same schedule. I suggest making due dates a part of your self evaluation because they are an important skill. With that said, I am always happy to work with you individually so please contact me if you are having trouble meeting a due date for an assignment.

## Help and resources

### Office Hours

Office hours are one of the most valuable resources I offer you. It is a time for you to talk with me one-on-one or with a small group about any question you might have. If you are nervous or unsure about office hours here are some reasons students routinely come to office hours:

- Early in the semester to say hi, talk about how this class might fit into their semester, and just build a little rapport as we go into the semester together. We often don't have much time for this during class getting to know my students is one of my favorite parts of the job!
- Some students work on homework in the math lounge down the hall during office hours so that they can just come by and ask me about any little thing that comes up or that they would like to discuss more.
- Some students attempt all of the homework and keep a list of questions or clarifications and bring those in to office hours.
- Students come to talk to me about opportunities in the math department or advice about future courses.
- My favorite is when a student simply comes by to tell me a joke. I like bad jokes.

I will host office hours in person and on Zoom at a variety of times but if you have any difficulty attending the regular times please reach out to me. You are not required to regularly attend office hours but I do *highly encourage* students to attend office hours. It really is one of the most valuable resources I have to offer you.

### Math Pirates

Our Math 15 Pirates will hold Study Sessions three times a week: Sunday, Tuesday, Thursday nights 8-10pm (EST). These study sessions are a wonderful opportunity to study, do homework, meet/work with classmates, and ask questions about mathematics. Because study sessions are drop-in, you are welcome to come and go as you please. To make the most of your time at study sessions be sure to first try problems on your own, or bring questions you have from your text or lecture. Having your textbook and lecture notes handy is essential because these are helpful resources for both you and the Pirate working with you. There will likely be other students at study sessions with questions for the Pirates, so do not expect to get individual attention the entire time you are there. Be open to working on other problems, thinking about and trying to work through the question you have for the Pirates, working with classmates, or doing other coursework while you wait to speak with the Pirates. In addition to the course specific Study Sessions held by Pirates, you are welcome to attend Math Clinic Sunday-Thursday nights 7-10pm. Utilizing Clinic is the same as making use of Pirate Study Sessions, but there may be students from different courses in attendance, as well. For questions about Pirate Study Sessions or Math Clinic please visit <https://www.swarthmore.edu/math-stat-academic-support/math-and-stat-clinics> or contact the Academic Support Coordinator for the Math/Stat Department.

### Collaboration

Collaboration is an important part of learning mathematics and I strongly encourage you collaborate with your classmate. However, some care should be taken to make sure that working collaboratively is actually improving everyone's learning. Remember, the goal is to learn mathematics, not complete assignments simply to complete them. I find it useful to set an expectation that each member of the group will be involved with solving every question on an assignment, and each person will write up their own submission separately. One good strategy for this is to do scratch work "solving" the problems while working with your group, but then write up the copy to

hand in on your own. If you find yourself asking a group mate a question and then immediately writing down what they say verbatim you probably did not process the answer. Try writing it in your own words and if you can't spend more time thinking about it, discussing it, or getting help from another resources.

## **Learning, Academic Integrity and the Internet**

The Internet is obviously a fantastic tool for accessing facts. Used well, it can also be a wonderful learning device as well. However, a great deal of mathematics on the web consists of solved problems being presented for students to basically copy. Googling a question will likely lead you to such information. While this may enable you to write down an answer to one question on one assignment, it won't build any understanding. I request that you avoid using the web for support in your work to complete assignments and solve problems. In a similar way, you should avoid using Wolfram Alpha to answer WeBWorK questions. Wolfram Alpha is great for computation, but it can't be a substitute for thinking. If you'd like to talk to me about some possible resources that would be valuable study aids, I'd be happy to have that conversation and suggest some.

On any course assignment, the only electronic resources I recommend are our course textbook, Active Calculus, other general expositions of Calculus, like Khan academy or your favorite alternative, technology such as Desmos and in rare circumstances Wolfram Alpha, and your class notes. If you want to use another resource ask yourself "is this helping my learning and why?". I would be happy to talk with you about it before (or after) you use them. I highly recommend that you do not go looking for completed solutions to problems in any other texts or resources.

Do note that I am generous with hints and am always willing to discuss exercises with you. While I will never simply give you an answer, I will offer direction and guidance that will assist you in coming to a solution on your own.

## **Academic Accommodations**

If you believe you need accommodations for a disability or a chronic medical condition, please contact Student Disability Services via email at [studentdisabilityservices@swarthmore.edu](mailto:studentdisabilityservices@swarthmore.edu) to arrange an appointment to discuss your needs. As appropriate, the office will issue students with documented disabilities or medical conditions a formal Accommodations Letter. Since accommodations require early planning and are not retroactive, please contact Student Disability Services as soon as possible. For details about the accommodations process, visit the Student Disability Services website. You are also welcome to contact me privately to discuss your academic needs. However, all disability-related accommodations must be arranged, in advance, through Student Disability Services.

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