Calculus@Penn

This document gives a brief snapshot of key things that we feel are important for students to know as you select and ultimately take a calculus course at Penn. **This guidance is for students in Math 1300, 1400, 1410, and 2400, each of which shares the same general structure.**

**Things to Know Before Your Course Starts**

- **Prioritize taking the course that is right for you.** The Math Diagnostic is exclusively for your benefit, to save having to guess and to avoid the anxiety caused by making the wrong choice. Your pre-major advisor can help you interpret your score. If you’re not sure the diagnostic captures relevant details, the Math Department <ugrad@math.upenn.edu> can help you synthesize your score and your prior preparation to determine which course is best for you.
  - When on the boundary, don’t rush to take the more advanced course. It is rare that a student must begin the calculus sequence in a specific spot to accomplish their goals on time.
  - At the same time, don’t worry if some of your peers have preparation which is different or more extensive than your own. Our courses are more demanding and cover more concepts and techniques than the BC Calculus curriculum and most other multivariable calculus courses, for example. We have also designed courses so that these prior experiences are not necessary to succeed. Your prior experience in math will not be a barrier to your success here.

- **A complete registration for calculus requires three components: lecture, recitation, and laboratory.** Not all lectures and recitations can be paired together, so make sure yours match. The labs are all on Friday and can be mixed-and-matched with any lecture/recitation combo. The purpose of labs is to be a reserved time for you to take the weekly quiz.

- **The structure of calculus at Penn is likely very different than previous math classes you've taken.** There are a number of key features and resources that are part of our overall learning environment:
  - **Out of Class Prep:** While not as common in math as in other subjects, **success in calculus at Penn requires you to come to class prepared** to make the most of that time. Depending on which course you’re in, this means completing some combination of assigned readings, video viewings, practice problems, and homework. **This will be an intense and challenging course and preparation is essential.**
  - **Prep Quizzes:** Because preparation is so important, your class will include graded components which reward staying on top of your out-of-class work. Prep quizzes in calculus courses are based directly on the assigned out-of-class work and have high average scores (above 95%). These are attainable points for students who are prepared.
  - **Active Class Sessions:** Our principle is that class time should be dedicated to those things which can only be done in class. This means using research-verified pedagogies like group work and active learning, which are demonstrably effective at deepening learning and creating more equitable learning environments. Regardless of your instructor, you should expect much of your time in class to be devoted to practice, individual and group problem solving, discussion, and other activities which are
focused on finding and working through points of confusion and difficulty. Your class will be centered on you—your questions, your thoughts, and your insights.

- **Recitation:** Recitation is an opportunity for you to review and practice what you’ve learned in a smaller group setting. Recitations are capped at 30 students each and are led by peer TAs who have previously taken the same course you’re in now.

- **Office Hours and Review Sessions:** Aside from class and recitation, there are many other weekly opportunities for you to ask questions and engage with the course material. Office hours are typically highly interactive, less structured, informal settings in which you and a few other students can ask questions of your TAs and instructors and discuss any and all issues relating to the course. Review sessions are usually large-group events designed specifically to recap the major themes that will be relevant to the upcoming quiz.

- **Friday Quizzes:** There are no longer high-stakes midterm exams. Instead, we have quizzes on an essentially weekly basis. Each quiz is worth only a small fraction of a traditional midterm (a typical Friday quiz may be around 5% of the final grade, whereas traditional midterms were often worth 5 or more times that). This changes the experience from one punctuated by high-stress cramming (usually peaking at the same time in all classes) to one that rewards consistency of effort and forgives the occasional “off week.” You will have the opportunity to drop several low quiz grades so that the work you are graded on reasonably reflects your best effort.

Different components of the course serve different functions, and individuals sometimes find some components to be more effective than others for them as they learn. This is completely normal; use them all to your advantage and build a weekly routine that works for you.

- **Don’t worry if you aren’t able to sign up for the course taught by your preferred instructor.** Calculus at Penn is more tightly coordinated now than ever in its entire history. Instructors now cover the exact same material to within plus or minus one day; all instructors have access to the same Penn course materials and resources (as do all TAs); sections all use the same Friday Quizzes and final exam for assessment. If your schedule conflicts with all sections but one and that section is closed, head to the Math Department main office (in DRL, Room 4W1) and they can help.

**Things to Know During Your Course**

- **Developing effective strategies for navigating the out-of-classroom components of this course is essential.** Your instructors will expect you to come to class prepared, having read or watched the assigned materials beforehand. In most cases, these materials will be your first point of contact with the concepts, techniques, and ideas that your course will be about, so skipping this foundational preparation can limit your ability to benefit from other components of the class. Many students find video watching in particular to be a challenging and unfamiliar sort of out-of-classroom work to do. Some tips for navigating it include:
  - Get your learning area ready, try to minimize distractions as much as possible (find a quiet spot, close distracting tabs, use headphones if you can), and have your notebook ready before you hit "play."
  - Another important thing to do before you begin is review and reinforce the context built up by surrounding material: review your notes from recent course activities and assigned readings/viewings. Check Canvas for information about what today’s video will be covering and guidance about particular things to know or think about as you’re watching.
  - Taking notes is absolutely essential for retention of the material.
    - Label your notes clearly at the top with the topic/unit/week to make it easier to find things later.
    - Pause the video as you’re writing so that you don’t miss anything.
    - Rewind and review sections that were confusing. Repeat at least twice, and don’t rush past the confusing parts: it’s critical to pause and reflect for a while on things that aren’t clicking.
    - Explicitly track things that you need to follow up on, and do not let your questions linger: ask your instructor about any questions you have after watching the video.
Make your notes comprehensive: if it’s written down in the video, it should be written down in your notes. The idea is to position yourself so that you don’t frequently need to go back to the video itself.

- It’s a normal and expected feature of both text material and video that it may take multiple passes (readings or viewings) to get the most out of it. The material is not easy and it’s normal for this course to require a lot of intentionality and "mental effort."

**Our texts and videos are comprehensive resources meant to offer something new each time you engage with them; you are not expected to become an expert on your first pass studying.** Your instructor will give you guidance to identify the most important things to focus on in your out-of-class work—those ideas, techniques, etc., which are critical for you to have at your fingertips when you come to class.

- Treat your notes as "raw materials" that you’ll use to produce things like study guides, flash cards, etc.

- **It is natural to feel more responsible for your own learning than you're accustomed to.** We expect students to engage with the content (e.g., definitions, techniques, and examples) by doing assigned preparatory video viewings or quizzes. Having this first round of effort take place asynchronously gives you more flexibility to schedule your week and enables class time to be used for more focused, demanding, and involved topics and tasks. If you’re finding it hard to navigate the asynchronous components of this course or aren’t perceiving the value added by class time, talk to your instructor—these concerns and questions are not uncommon and your instructor can help you make connections that might not always be apparent.

- **It is also natural to feel that the preparatory work leaves you with many questions or otherwise fails to fully explain everything that you need to know.** Your preparatory work is very much the beginning of the process and is not expected to stand alone. You are not expected to achieve expertise just through reading preparatory texts or watching videos. It is reasonable, expected, and even valuable for this work to raise questions that it doesn’t resolve by itself. Track these unresolved questions and issues raised during your preparation and bring them to class, recitation, office hours, and review sessions.

- **It is natural to find that your calculus course is demanding and takes more time than any of your other courses.** Anything in the range of ten to fifteen hours per week spent on this course is within the expected outlay of effort. If you find that you’re consistently spending well over fifteen hours per week on course activities, keep a log for one week in which you record all activities related to the course for that week (studying, reading, watching videos, going to class, lecture, quiz, etc.). At the end of your log week, take your findings to your instructor, who can help you spot red flags or other indications that there may be more efficient ways for you to navigate this course.

- **A counterintuitive but very real consequence of higher expectations and more active pedagogies is that it feels like it's not working as well as a traditional approach, when in fact it works demonstrably better.** This effect is recognized by research. The negative correlation between actual learning and perceptions of learning is due partly to the increased cognitive effort required—you spend more time directly confronting your own confusion and less being shown neat and tidy solutions.

- **Managing stress around Friday Quizzes is important.** Many students are so used to exams being infrequent and high stakes that often these subconscious attitudes transfer over to the Friday Quizzes in ways that aren’t quite accurate or helpful. Friday Quizzes are a marathon where midterm exams were a sprint, and there are several ways for you to use this difference to your advantage.

  - In comparison to a typical midterm exam, Friday Quizzes are extremely low stakes—each worth only a few percentage points of the course grade. And because they can be challenging for everyone, very few students will have near-perfect records on the Friday Quizzes and failing to have a near-perfect record does not automatically mean that your desired grade is out of reach. The drop policy further insures you against your worst days. It’s okay to not be at your very best every single week.

  - Similarly, regular quizzes give you opportunities to spot problems and adjust much earlier than you would be able to in a midterm-based course. Quizzes begin before the end of the Course Selection Period, so the first quiz can give you a valuable signal if you’re not sure you’ve selected the right calculus course. Later on in the semester, regular quizzes give you weekly feedback on how you’re doing. If your weekly quiz grades aren’t where you’d like them to be, take your graded work with you to your instructor or TA, who can go over it with you and help you find ways to improve your performance.

- **When in doubt, reach out!** We are here to help you succeed and can provide many different kinds of individual support.