

Syllabus

Let's take care of some of the bureaucratic matters first:

- **Who's the teacher?** Dr. Patrick Bahls (please feel free to call me Patrick).
- **When is class?** Section 1 meets from 11:25 a.m. to 12:15 p.m. on Monday, Wednesday, and Friday, and from 9:25 a.m. to 10:40 a.m. on Thursday. Section 3 meets from 1:45 p.m. to 2:35 p.m. on Monday, Wednesday, and Friday, and from 1:45 p.m. to 3:00 p.m. on Thursday.
- **Where is class?** Carmichael Hall, Room 132. Oh, *how* you will come to know and love that room!
- **What text are we using?** *Calculus (Early Transcendentals)*, by Jon Rogawski (ISBN-13: 978-0-7167-7267-5).
- **What do I bring to class?** Yourself, and something to write on/with. (You *will* be doing a good deal of writing in class.) You may bring a graphing calculator if you wish to, but this is certainly not required. I will let you know if on any given day you will need to bring anything else.
- **What about office hours?** I will soon be scheduling office hours at times which prove convenient for the class as a whole. As you will come to know, I'm in my office almost constantly throughout the day on most days, and I'm definitely willing to meet at other times by appointment.
- **How can I get a hold of you?** My office phone number is 232-5190, and my e-mail address is patrick.bahls@gmail.com. (E-mail's the best way to get me.) Or just stop on by my office; if you catch me, I'm yours: Room 324, Robinson Hall.
- **Do you have a website?** Yes indeed: <http://facstaff.unca.edu/pbahls>. From there you can find easy links to the course websites, and resources like this here syllabus. Chances are if you'll need anything course-related throughout the semester, it'll be on the website, so *please* look before asking!
- **What other resources will I have available to me?** I'm glad you asked! You will have the Math Lab at your disposal, a room in the Mathematics Department devoted solely to providing you with help in studying and on homework. This service (located conveniently across the hall from my office!) will be available to you throughout most of the day, most days of the week. Precise hours will be posted soon. I encourage you to make as much use of the Math Lab as you need to as the semester progresses.

All right, I'm sure you're all wondering by now...

What will we be studying? Very roughly speaking, calculus is the study of dynamic relationships between multiple varying quantities. It can be used to answer questions ranging from “what paths do air molecules follow as they float around in the atmosphere?” to “what financial forces govern the fluctuations in the international economy?” Any time you've got one quantity depending on some fashion on another, you can begin to analyze their relationship using calculus. What happens if one quantity increases? Does the other increase or decrease? How *much* does it increase or decrease? Can you find the places where this increase or decrease is at its greatest? How do such problems occur in natural and social sciences, like physics, chemistry, biology, economics, sociology, psychology?

Wow!

We'll look carefully at these issues, and others, as the semester progresses. As we work through most of the first five chapters of our textbook (not always in the order those chapters are laid out), you will also learn how to make “real-world” problems mathematically precise, to perform formal mathematical analysis, and to think critically about the conditions present in a given mathematical problem. More than anything else, I hope that you take from this class a deepened understanding of what it means to think carefully and critically.

We will encounter some truly difficult problems this semester. Please keep in mind as you grapple with these posers that many brilliant mathematicians and other thinkers spent *thousands of years* coming up with the ideas we'll talk about in the next fifteen weeks. The moral of the story is that a little struggle is perfectly natural!

What do you expect me to get from this course? Good question. Here are some of the learning objectives for this course, not necessarily given in order of importance; think of these as a list of things you ought to be able to do long after the class is over:

- Be able to explain to a peer the concepts of *limit*, *continuity*, and *derivative*.
- Demonstrate how basic problems in physics, engineering, chemistry, and other fields can be couched in math terms using mathematical models.
- Be able to follow confidently the course of a simple proof.
- Be able to perform and properly interpret derivatives.
- Demonstrate (through informed question-asking) a healthy skepticism regarding mathematical and scientific arguments.
- Demonstrate how to approach a (not necessarily mathematical) problem effectively by breaking it down into smaller problems, arguing by analogy, and applying other basic problem-solving techniques.

How will I be graded? You will be asked to complete a variety of assignments, including somewhat traditional homework problems from the textbook (as well as a few more “nontraditional” problems invented by me), exploratory team projects, brief quizzes (including team quizzes), midterm exams, and a single cumulative exam at the semester’s end. These assignments will contribute to your overall score with the following weights:

- **Homework:** 25%
- **Projects:** 5% each, totalling 10%
- **Quizzes:** 15%
- **Midterm Exams:** 10% each, totalling 30%
- **Final Exam:** 20%

Here’s a little more robust description of each component of the coursework:

- *Homework.* **Yes, I will** grade homework. I will not grade *every* homework problem fully: those problems that I grade fully will be chosen at random from among those I have assigned; generally I will grade roughly 20% to 25% of the homework problems in this thorough fashion, and even *I* will not know until Friday afternoon at 5:00 p.m. (when all homework will be due!) which problems will be selected for grading.

Keep in mind that keeping up with the homework is not only good for your grade, it’s good for your mind. The best way to learn mathematics is to *do* mathematics, and the homework will provide you with an excellent place to practice doing math in a low-pressure setting. I cannot encourage you strongly enough to *work on the homework together*. Study after study shows that those who work together to complete course assignments learn more from the class.

- *Team projects.* There will be two in-depth team projects you will be asked to complete during the semester. These projects will involve not only teamwork but also a bit of writing, and they may be “staged” to incorporate multiple drafts and opportunities for peer review. The first project, *Newton v. Leibniz*, will challenge you to stage a civil trial between the two co-discoverers of calculus, Isaac Newton and Wilhelm Gottfried von Leibniz. The second, *Can you handle this?*, will challenge you to apply a number of the methods you’ll learn in class to develop a solution to a relatively “cluttered” real-world problem involving calculus in a meaningful fashion.
- *Quizzes.* Once a week we will have a short (roughly 10-minute long) individual quiz addressing the concepts currently under consideration. You will not be allowed to make up quizzes missed during unexcused absences. Additionally, roughly once every other week, we will have a *team* quiz, on which you will work with the team members of the team to which you’re currently assigned. The team quizzes will allow you to earn extra credit that can be applied towards your individual quiz average.

- *Midterm exams.* There will be three in-class, individual exams. I will post tentative exam dates on the class website as these dates approach. Make-up exams will be allowed only for excused absences arranged in well in advance. I reserve the right to not allow a make-up exam; keep in mind that extenuating circumstances typically involve loss of limbs and/or large amounts of blood.

In the class period following a midterm exam I will return your exam (roughly corrected) with a “tentative” grade assigned to it. You will then be given the opportunity to perform corrections on the exam before resubmitting the exam to receive a final grade on it. A well-corrected problem will earn you up to $1/3$ of the points you missed on the problem the first time around. For example, if you missed 12 points on the exam the first time around and you perform flawless corrections in revising your exam, you would earn $12/3 = 4$ points back. Note that I will be quite stingy with points in grading your revisions, as you will have had ample time and resources to affect your corrections!

- *Final exam.* As I strongly believe that for an examination to be worth the while of taking it, you must be granted time to reflect deeply on the problems it contains, the final exam will be a cumulative **take-home** exam. It will be handed out during one of the final days of class and due during final exam week, so that you will have a few days to complete the exam with the help of your notes and textbook. More details on this exam will be included as the semester progresses and the date draws nearer.

A word about writing. I am firmly of the belief that in order to be a good mathematician (or student of mathematics) one needs to be able not only to *understand* mathematics, but also to *explain* mathematics well to others. Therefore, you’ll find that I will frequently challenge you to communicate your mathematical discoveries to one another, both in presentations in class and through writing.

I believe that writing plays a particularly important role in developing mathematical understanding, for it is in writing math that you best learn how to organize your thoughts, and how to put together the pieces of whatever computation or proof with which you’re currently working. Thus you will be asked to write a good deal during the semester: in addition to traditional homework problems, your projects will feature written assignments, and you will often be asked to complete brief “low-stakes” writing exercises in class...sometimes no one but you will ever see the results of your writing in these exercises, but I am convinced (and numerous studies show) that you’ll stand to gain much by completing them.

I hope that you will keep an open mind regarding the writing assignments you’re asked to complete in our class this semester. In the past my students have gained tremendous and useful experience from these assignments, and I’m sure you will, too.

That’s all I’ve got to say for now. Please let me know at any time if you have any questions. For now, why don’t you sit back, get settled in, and prepare to learn!