MATH 150-03 Elements of Calculus I

Joseph Wagner

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Math 150-03: Elements of Calculus I  
Spring Semester 2014, Xavier University

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Class Meetings: WF: 3:00-4:15  
Hailstones 17

Office Hours:  
Monday & Wednesday 1:30-3:00; Tuesday & Thursday 11:00-12:30.  
Also available by appointment, drop-in, or chocolate (unless I throw you out)

Required text


A paperback compilation of the sections of this text used in this course is available through the Xavier bookstore.

Prerequisites

You should have successfully completed MATH 120 at Xavier, or its equivalent elsewhere. That means you should have a strong background in high school algebra and pre-calculus mathematics. No prior knowledge of calculus is required or presumed.

Course description

Calculus is the mathematics used to describe and measure how things change. Differential calculus is used to study rates at which change occurs, and integral calculus is used to calculate how much change accumulates if the rate of change is known. MATH 150 is an informal introduction to both differential and integral calculus, designed for a general audience, and applied to situations taken from business, finance, economics, the health sciences, and other fields. Often starting with real-world data, we will generate mathematical “models” of real-world situations with the help of good mathematical thinking and our TI-83/84 calculators, and analyze and interpret these models using the tools of calculus.

While computation and symbolic manipulation are essential to calculus, this course will require students to engage in deeper levels of conceptual *sense-making* and *understanding*. We will focus on how knowing *how* to do something must be backed up with knowing *why*, and learn how mathematical understanding may be expressed both verbally and through written work. *Learning mathematics is NOT just about “getting the right answers.”* It is about speaking and writing the language of mathematics, using the notation and representational forms of mathematics, and communicating and justifying your mathematical ideas in a clear and coherent manner so that others can understand you. It also means being able to write clearly and coherently in good, standard English. All of these aspects of your mathematical knowledge will be emphasized and assessed in this course.

Mathematics is a social activity

Working together, both with me and with one another, will be emphasized in this class. Working with others has the (sometimes uncomfortable) effect of “stretching” us—sometimes to articulate ourselves better, sometimes to realize the limits of our understandings, sometimes to understand
how someone else may approach a problem very differently. In addition to working together in class, you are encouraged to find study partners or to form study groups outside of class. If you’ve ever tried to learn a second natural language, you know that coming to understand what you read and hear is often considerably less difficult than expressing yourself orally and in written word. So, too, with mathematics.

**Learning objectives**

By the end of this course, successful students will be able to

- Describe the central ideas of differential and integral calculus, including the notions of limit, derivative, and integral, and the usefulness of these ideas in analyzing real-world situations.

- Interpret numeric, algebraic, and graphical representations of abstract functions and models of real-world situations using the language and tools of differential calculus.

- Demonstrate algebraic facility in computing derivatives, antiderivatives, and integrals, and setting up and solving appropriate equations to determine their critical features.

- Apply the central ideas of calculus to express, solve, and interpret real world problems modeled by the types of functions used in this course.

- Express all of the above both verbally and in writing using clear, concise, and meaningful language, including grammatically correct English and the language and symbols of mathematics.

This course fulfills one of the Mathematics course requirements of the University Core Curriculum. The course objectives contribute directly to Goals 1, 2, 3, and 4 of the University Core Curriculum.

**Canvas**

Xavier has just this year adopted *Canvas* as its campus-wide course management system. (It is a vast improvement over *Blackboard*, which we had used for years.) All course information, assignments, announcements, etc. will be made available through *Canvas*. Please be in the habit of checking it regularly, and note that you can adjust your *Canvas* settings to update you automatically via text-message or various social media when something happens on our *Canvas* course page. Log on and familiarize yourself with how it works: canvas.xavier.edu

**Using technology**

Everyone is expected/required to have a TI-83 or TI-84 graphing calculator, and it may be used for all activities, assignments, and exams, unless I explicitly indicate otherwise. (At times, some efforts at basic memorization are important, and I may occasionally ask you to work without a calculator. You will always have advanced notice of such instances.) A TI-83 or TI-84 is recommended/required for all mathematics courses at Xavier. You might get by with a different model, but I take no responsibility for helping you figure out how to use it appropriately. However, calculators/computers capable of performing symbolic algebra will NOT be permitted on exams.
**Reading & Homework**

You are expected to read assigned chapters of the book according to the schedule posted on *Canvas*. Homework assignments will typically be due weekly, and they will be of two types:

- **WeBWorK assignments**: WeBWorK is an online management system for mathematics assignments. Assignments involving primarily algebraic skills and computations will be assigned through WeBWorK, which will (usually) give you immediate feedback on your answers. A separate handout will introduce you to how WeBWorK works.

- **Written assignments**: Mathematics is not all about algebraic skills and computations. Problems that require deeper conceptual understanding, sense-making, and explanation will be assigned as written assignments in addition to the online assignments. Written assignments will also used to evaluate your ability to use the language and symbols of mathematics correctly. WeBWorK checks that your answers are correct, but written assignments are used to assess your ability to write legitimate solutions and explanations.

Assignments will usually be due in class on Wednesday of each week. WeBWork scores are determined immediately online. Written assignments will usually be scored out of ten points each, based on overall completeness, neatness, legibility and use of appropriate notation (4 pts) and on the evaluation of one, two, or three selected problems each week (6 pts).

Written assignments must be **professional**: neat, legible, preferably written in pencil, and stapled. Loose pages or sloppily prepared work that looks like scratch-paper will *not*, I repeat *NOT* be accepted. (Students routinely lose credit for not following those basic instructions.) Late homework will be accepted (if complete) and receive a grade of zero. At the end of the semester, I will drop your two lowest scores awarded to *completed* written homework in computing your final grade. Pay attention to the implications of that: Written assignments completed and turned in late will be awarded a zero, but they may be dropped. Scores of zero for written assignments not turned in or turned in but considerably incomplete will *not* be dropped. (There is no drop policy for WeBWorK assignment scores.)

**Exams**

There will be three regular exams and a comprehensive final exam. The three regular exams are *tentatively* scheduled for Friday, February 7; Friday, March 14; and Wednesday, April 16. The final exam is scheduled for Friday, May 9, 2:00-3:50. A regular exam may be taken at an alternate time *only* for very good reasons (by my definition), and, except in case of verifiable emergency, *only* if arrangements are made in advance. The final exam schedule is set by the university and cannot be changed except by permission of the dean.

**Grading**

Your final grade will be based on the following percentage distribution:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Written assignments</td>
<td>20%</td>
</tr>
<tr>
<td>WeBWorK assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Participation and group work</td>
<td>10%</td>
</tr>
<tr>
<td>Three regular exams</td>
<td>40%</td>
</tr>
<tr>
<td>Final exam</td>
<td>20%</td>
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</tbody>
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Letter grades will be assigned according to the following scale: A/A- (90-100%), B/B± (80-89.9%), C/C± (70-79.9%), D (60-69.9%), F (< 60%). I reserve the right to make it easier—but not more difficult—to earn a particular grade. Plus-minus grades reflect the top 2% or bottom 2% of each of the above grade ranges. I do not intend to use the grade of D+.

There is one possible exception to the above: In order to earn a particular letter grade for the course, you must have earned at least that letter grade on at least two regular exams or on the final exam.

Attendance

Because I understand human nature, and because we have the misfortune of having to meet late on Friday afternoons, I am instituting the following attendance policy: For up to three absences (for any reason), you will occur no penalty. A fourth absence will incur a penalty of a 2-percentage-point grade reduction in your final course grade. An additional 1-percentage-point reduction in your final course grade will be incurred for each additional absence beyond four. In addition, two late arrivals or early departures without prior arrangement will count as one absence. (“Late” is defined to be “arrival after 3:00pm.”) If you are going to arrive late, leave early, or be absent, please inform me by phone, voice mail, or email before class begins.

Academic Honesty

In accordance with the University Catalog:

“All work submitted for academic evaluation must be the student’s own. Certainly, the activities of other scholars will influence all students. However, the direct and unattributed use of another’s efforts is prohibited as is the use of any work untruthfully submitted as one’s own. Penalties for violations of this policy may include one or more of the following: a zero for that assignment or test, an ‘F’ in the course, and expulsion from the University.” (See the current University Catalog for a more complete statement at http://catalog.xavier.acalog.com/.)

You are encouraged to work and study with other students in class and to learn from one another as opportunities provide. However, turning in the work of another, collaborating on assignments when prohibited, or providing your work to someone else will be considered academically dishonest. It is my practice to handle such cases with the severest penalties possible.

Misuse of Technology

Except for your calculator or other permitted exceptions, electronic/wireless devices (phones, iPads, iPods, music players, etc.) are NOT to be used during class time. Anyone found using such a device during class may be asked to leave the room for the remainder of that class. Anyone found violating this policy a second time may be subject to a one-step grade reduction of your final course grade.

The use of any electronic devices (other than your calculator, if permitted) during an exam is strictly prohibited. If you use any such device during an exam for any reason whatsoever you may be awarded a grade of “0” for that exam.
You

Your success in the course is important to me. At the same time, however, I usually cannot make it more important to me than you make it to yourself. If you need help, please ask for it. There is a lot of help available from each other, from other students, from me, from the Math Tutoring Lab in Conaton 419, and from the Learning Assistance Center in Conaton 514. Please know that you are always welcome to approach me with any concerns you have about your own progress or the progress of the class in general. If you do not, however, there is little I can do to make things work for you. An indicator of academic maturity and responsibility is knowing when to ask for help!

If you are anticipating any difficulties in this class (possibly because you’ve been known to have them before, you haven’t taken a mathematics course for quite some time, you have some type of learning disability, etc.), please let me know. If you have a documentable learning disability (or you think you may have one), please contact the Learning Assistance Center in Conaton 514 as soon as possible. It’s a lot better to deal with potential problems before they occur rather than wait until it’s too late. If, for any reason, you consider dropping this course, please discuss it with me beforehand. Students sometimes tend to think that they are doing more poorly than they really are.

An observation

I have often heard students say to me something like this: “I understand things fine when we’re in class, but for some reason I can’t do it on the homework or on the test.” Perhaps you’ve said something like that yourself at times.

I believe students who say this, but I think what’s really going in is more complex. The reality is probably more like this: “When the professor does it and explains it in class, it makes sense to me. But I am not able to generate on my own the kinds of explanations and solutions that the professor gives.” It is important to realize that making sense of what someone who understands the mathematics says to you does not mean that YOU understand the mathematics. It means the other person is good at expressing his or her own understanding.

The challenge of learning mathematics is not just to make sense of what someone else tells you; it is to come up with and communicate your own explanations for the mathematics we’re learning. That does not and cannot happen simply by listening to and making sense of what someone else says. It can ONLY be done by going through the sometimes lengthy process of struggling with ideas and problems, and generating solutions and explanations on your own.

Does that sound difficult? IT IS! Learning mathematics is difficult! It takes lots of time, lots thought, lots of effort, lots of mistakes, lots of frustration, and lots of practice. It requires physiological changes in your own brain that come from mental effort that can be just as tiring to achieve as the physiological changes in your muscles that come from physical effort. There is no way around this. If you are not putting at least 5-6 hours of work into his course each week outside of class, you are not approaching the kind of effort needed by most people to learn to make sense of the material we’re studying.

Except in a rather small number of cases, the ability to learn and make sense of mathematics is not something inborn, innate, or something “we either have or we don’t.” It is always and everywhere, for you, for me, and for everyone, the result of hard work. The unexpected side-effect for many people is that, at some point, all the hard work results in experiences that are both deeply satisfying and lots of fun!