

MA 137: Calculus I with Life Science Applications¹

MWF 11:00-11:50 AM CB 110

Spring 2019

Professor: Dr. David Royster

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Office hours: MWF 1000-1050 AM or by appointment

Class webpage: Canvas — <https://uk.instructure.com>

Course Description: A first course in one-variable calculus. Derivatives and integrals of elementary functions (including trigonometric functions) with applications to the life sciences. Lecture, three hours; recitation, 2 hours per week. Students may not receive credit for MA 113 and MA 137. Note: Math placement test recommended.

Prerequisites: Math ACT of 27 or above, or math SAT of 620 or above, or MA 109 and MA 112, or MA 110, or consent of the department. Students who enroll in MA 137 based on their test scores should have completed a year of pre-calculus study in high school that includes the study of the trigonometric function. [*Per Senate Rule 4.3.3, students will not be permitted to register for this course for a fourth time. To request an exception to this rule, visit*

<https://math.as.uky.edu/lower-level-math-overrides.>]

Textbook: *Calculus for Biology and Medicine* by Claudia Neuhauser and Marcus Roper, 4th edition.

Recitations:

TR 08:00-08:50 AM, CB 339 (Section 001)

TR 09:00-09:50 AM, CB 339 (Section 002)

TR 01:00-01:50 PM, CB 339 (Section 003)

TR 02:00-02:50 PM, CB 339 (Section 004)

¹I reserve the right to change or amend this syllabus at any time for any reason.

Teaching assistants: James Veas, WJamesVeas@uky.edu, Sections 001 & 002
 Samuel Herschenfeld, samuel.herschenfeld@uky.edu, Sections 003 & 004

Course Outline: We begin by introducing the notion of a limit, both for sequences and for function of a real variable. Limits are essential to defining derivatives and integrals. By the end of the semester students should know precise definitions of the derivative and the integral and understand the fundamental theorem of calculus which gives the relation between the derivative and the integral. We will illustrate the methods and ideas of calculus by studying several problems from biology. We will study the interpretation of the derivative as a rate of change, and model growth and declines of populations.

1. Chapter 1: Preview and review
 Preliminaries, elementary Functions, and graphing
2. Chapter 2: Discrete time models, sequences, and difference equations
 Exponential growth and decay
 Sequences
 More population models
3. Chapter 3: Limits and continuity
 Limits
 Continuity
 Limits at infinity
 The Sandwich Theorem and some trigonometric limits
 Properties of continuous functions
4. Chapter 4: Differentiation
 Formal definition of the derivative
 The power rule, the basic rules of differentiation, and the derivatives of polynomials
 The product and quotient rules, and the derivatives of rational and power functions
 The chain rule and higher derivatives
 Derivatives of trigonometric functions
 Derivatives of exponential functions
 Derivatives of inverse and logarithmic functions
 Approximations and local linearity
5. Chapter 5: Applications of differentiation
 Extrema and the Mean Value Theorem
 Monotonicity and Concavity
 Extrema, inflection points, and graphing
 Optimization

L'Hospital's rule
 Difference equations: stability
 Antiderivatives

6. Chapter 6: Integration
 The definite integral
 The Fundamental Theorem of Calculus

Student Learning Outcomes:

- apply the methods of calculus in new contexts to solve unfamiliar problems;
- compute fluently;
- write correct justifications for their solutions to problems.

Grading: We will have homework, three tests, and a final. The schedule of tests, homework and the final exam is available on Canvas.

Exam 1: Tuesday, February 5, 5:00–7:00 PM

Exam 2: Tuesday, March 5, 5:00–7:00 PM

Exam 3: Tuesday, April 9, 5:00–7:00 PM

Final Exam: Wednesday, May 1, 8:30–10:30 PM

Grades: You will be able to obtain a maximum of 500 points in this class, divided as follows:

Three 2-hour exams @ 100 points each	300 points
Final exam @ 100 points	100 points
Homework	50 points
Recitation quizzes	15 points
Class participation	15 points
Final project	20 points
Total	500 points

Your grade will be based on the number of points you earned according to the following scheme:

Total Points	450–500	400–449	350–399	300–349	0–299
Final Grade	A	B	C	D	E

Mid-term Grades: Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>).

Calculators and Laptop Computers: You may use a graphing calculator on exams and homework. The use of machines with symbolic manipulation capabilities is not allowed during examinations. You may not use any machine (carbon-based or silicon-based life form) that has symbolic manipulation capabilities of any sort on

any exam. This precludes the use of TI-89, TI-Nspire CAS, HP 48, TI 92, Voyage 200, Casio Classpad, iPad, tablet or laptop computer. Also, you may not use your cell phone, iPhone, or Blackberry on any exam — even if you forget your regular calculator. If it runs Windows, UNIX, Linux, Ubuntu, MacOS, PalmOS, BeOS, or any derivatives or associates thereof, you cannot use it on the exams. Check with me if you have any questions as to whether a particular machine may be used on a test.

Computers (including laptops, notebooks, iPads, etc.) may be used and required during lectures.

Course Policies:

- *Attendance:* Attend lectures and recitations regularly. Be on time and remain until dismissed. Do not leave in the middle of class. Instructors have the right to take off attendance points for coming late or leaving early. If you cannot come to lecture or recitation and would like to request an excused absence, inform the instructor as early as possible and provide documentation.
- *Unexcused Absences:* You are allowed 2 unexcused absences. Beyond that, you will lose 2% of your overall course grade for each unexcused absence.
- *Excused Absences:* Students need to notify the professor of absences prior to class when possible. Senate Rule 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.
Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class.
- *Make-up policies* Per Senate Rule 5.2.4.2, if you are missing any graded work due to an excused absence you are responsible for informing the Instructor about your excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The instructor will give you an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred. In particular, if you have university excused absences or have university-scheduled class conflicts with uniform examinations you may arrange with their instructor to take the exam at an alternate time. Generally these make-up exams will be scheduled on the day of or on the day after the regularly scheduled exam. Work-related conflicts are neither university excused absences nor university-scheduled absences.
- Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy. Per Senate Rule 5.2.4.2, students missing any graded work due to an excused absence are re-

sponsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

- *Verification of Absences:* Students will be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence when feasible and in no case more than one week after the absence.
- Classes meet as usual on the days after an exam. Attendance rules apply as usual.
- Classes do meet as usual on Monday and Tuesday of Thanksgiving week. Attendance rules apply as usual.
- *Accommodations due to disability:* If you have a documented disability that requires academic accommodations, please see your instructor as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide the instructor with a Letter of Accommodation from the Disability Resource Center (Suite 407, Multidisciplinary Science Building, 725 Rose Street. Contact Susan Fogg, Disability Accommodations Consultant, drc@uky.edu, (859) 257-2754) for coordination of campus disability services available to students with disabilities.
- *Missed work* In order to be fair to all students, dates for exams and homework assignments are firm. It is very important to take each exam on schedule. Missed work may be made up only due to illness with medical documentation or for other unusual (documented) circumstances. If you have a university excused absence or a university-scheduled class conflict with uniform examinations please contact your lecturer as soon as possible, but at least 10 days before the exam, so that an alternate exam can be arranged for you.
- *Academic Dishonesty:* Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed. Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the website Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review

this information as all ideas borrowed from others need to be properly credited. Senate Rules 6.3.1 (see Senate Rules for the current set of Senate Rules) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about a question of plagiarism involving their work, they are obliged to consult their instructors on the matter before submission. When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording, or content from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work (including, but not limited to a published article, a book, a website, computer code, or a paper from a friend) without clear attribution. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work, which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources or information, the student must carefully acknowledge exactly what, where and how he/she has employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content, and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas, which are so generally and freely circulated as to be a part of the public domain.

Students are encouraged to work together to understand a problem and to develop a solution. However, the solution you submit for credit must be your own work. In particular, you should submit your answers for web homework. Copying on exams and usage of books, notes, or communication devices during examinations is not allowed. Cheating or plagiarism is a serious offense, and it will not be tolerated. Students are responsible for knowing the University policy on academic dishonesty. The following are a few examples of academic dishonesty

1. using someone else's clicker in class or asking someone to falsely use one's clicker in class;
2. sharing answers on an exam by texting or other messaging apps;
3. having another student complete an assignment for you or give you answers to specific questions;
4. using unauthorized materials or hardware on an exam;
5. looking at another student's answers during an exam;
6. having someone else take your exam for you;
7. lying about having taken an exam or completed an assignment.

- Be on time to class and remain until dismissed. Do not leave in the middle of class.
- *Accommodations due to disability:* If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multi-disciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at drc@uky.edu. Their web address is <http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>.
- *Accommodations for victims of violence:* By federal law, any student who is a victim of dating violence, domestic/intimate partner violence, sexual assault, or stalking (whether on or off campus) is entitled to appropriate accommodations for his or her coursework. To get help getting accommodations and other support, students who are assaulted can do any of the following:
 1. Tell your instructor who can assist you in accessing resources appropriate to your situation;
 2. Call the UK VIP Center (Violence Intervention and Prevention Center) at 257-3574 or vipcenter@uky.edu or http://www.uky.edu/StudentAffairs/VIPCenter/about_contact.php; or walk in to the Center in Frazee Hall, lower level, between 8:30 and 5:00;
 3. Call the University Counseling Center at 257-8701; 2nd floor, Frazee Hall;
 4. Call Ms. Patty Bender from the UK Institutional Equity and Equal Opportunity at 257-8927 or patty.bender@uky.edu;
 5. In the case of an emergency, contact the UK Police Department at 911.
 6. Students may also contact community resources 24-hours a day, including:
 - (a) Bluegrass Rape Crisis Center at (800) 656-4673 or <http://bluegrassrapecrisis.org/>
 - (b) Greenhouse17 (formerly Bluegrass Domestic Violence Program) at (800) 544-2022 or <http://greenhouse17.org/>

Inclement Weather Policy: The University of Kentucky Severe Weather Policy can be found at http://www.uky.edu/PR/News/severe_weather.htm. The UK Infoline at (859) 257-5684, UK TV Cable Channel 16 and 19, or the UK Web site at www.uky.edu are the best places to find the most up-to-date situation.

If you feel that travel during inclement weather would be hazardous, then try to inform your instructor as soon as safely possible. You will be given the opportunity to make up any work missed or due on that day. As always, each student is responsible for any work missed and will be expected to get the notes from another student or from the web.