

MATH 0350 SYLLABUS
FALL 2017
BROWN UNIVERSITY
SAMUEL S. WATSON

EMAIL	sswatson@brown.edu
WEBSITES	https://canvas.brown.edu/courses/1073761 (the main site), and http://www.math.brown.edu/~sswatson/math0350.html (for quick access to assignments)
CLASS MEETING	Tuesday and Thursday 14:30 to 15:50 in Salomon Center 003
OFFICE HOURS	Wednesday 14:00 to 15:00 and Thursday 16:00 to 17:00, and by appointment. Office hours are for everyone! There is no threshold for how poorly or how well you need to be doing in the course to attend office hours.
TOPICS	We will learn about visualizations of functions of multiple variables, vectors, dot product, cross product, the geometric meaning of the determinant, lines and planes in space, motion in space, quadric surfaces, multivariable limits and differentiation, linear approximation and the chain rule, the directional derivative, multivariate optimization, Lagrange multipliers, 2D and 3D integration in various coordinate systems, vector fields and line integrals, the fundamental theorem of vector calculus, Green's theorem, surface integrals and flux, divergence and curl, Gauss' theorem and Stokes' theorem.
TEXTBOOK	<p>I have written a short book for a condensed summer multivariable calculus course, and I will expand it for use in Math 0350 as the semester progresses. It is available in PDF form on the website (and its 3D graphics can be manipulated interactively in Adobe Reader). This will be the main course text.</p> <p>For students who prefer a more traditional textbook and don't want to spend money, there is a free book available at</p> <p>https://www.whitman.edu/mathematics/multivariable/multivariable.pdf</p> <p>For students who prefer an even more traditional textbook and do want to spend money, I recommend Susan Colley's <i>Vector Calculus</i>, which is both readable and suitably rigorous for an honors course.</p> <p>Note that the campus bookstore does not have any of these books.</p>
STUDENT SATISFACTION & INCLUSION	My top priority is for you to have an excellent learning experience in this course. I intend to set clear learning objectives and equip you with the right tools to achieve them. I invite comments, criticisms, concerns, and suggestions at any time. If you perceive that you are not doing as well as you'd like, please see me right away. I can help with math concepts, of course, but I am also happy to help you troubleshoot your approach to studying, problem solving, etc. I will grant you the assumption that you are doing your best to learn, and I have zero interest

in making you feel judged. *You should have every expectation that you can translate hard work into a commensurately high final score.* However, the responsibility to do that is ultimately yours.

IClicker Cloud To encourage punctual attendance, support active learning during classtime, and help you check your comprehension, we will have iClicker Cloud questions in class, which you will answer using your smartphone app or laptop browser (if you do not have either of these, note that it is possible to check out a laptop). Your daily score will be 15 points participation (if you answer all the questions or all but one), plus 1 additional point for each correct answer. Your iClicker score for the course is the average of your daily scores, after the three lowest scores are dropped. If you join the course late, you will be required to use these drops for any days you miss at the beginning.

WebWork Homework Each week you will have an assignment in the free online homework platform WebWork. See the website for instructions on how to register for WebWork. This part of the homework will provide you with rapid feedback so you know you're on track with your learning objectives. The weekly deadline is **Wednesday at 6 PM**. Your work should be completed over the course of the week and your progress is saved as you complete each problem. Accordingly, the 6 PM deadline is hard.

Gradescope Homework In addition to the WebWork homework, you will have some written problems each week on **Friday at 6 PM**, which you will scan and submit through a free grading platform called Gradescope. This homework component will give you an opportunity to get consistent feedback on your solution writing, which will be helpful preparation for exams. Please visit the course website for details on how to sign up. Because you will often be submitting all your work shortly before the 6 PM deadline, there will be a 2-hour grace period to help you out in the event of technical difficulties. There is no score penalty, but your work will be marred with a big red "late" indicator. No submissions are accepted after the grace period.

Homework Policy To preclude adjudication of late-work excuses, each student is granted **two** opportunities to miss the homework deadline with no penalty (to wit: late work is not accepted for any reason, but the lowest two WebWork homework scores and the lowest two Gradescope homework scores will be dropped at the end of the semester). You are expected to use your drops **extremely sparingly**. The two-drop policy is already generous, so if you use up your drops and then find yourself needing another, regardless of the reason, you will have to take a zero.

Some homework problems will be quite challenging, and much of your learning will come from working on problems. Plan to start early, ask questions, and work together. Each problem set will cover content from the calendar week preceding its due date.

Grading Your final grade will be calculated as follows:

iClicker score	10%
WebWork homework	10%
Gradescope homework	10%
Midterm	30%
Final exam	40%

If your final average is 90% or higher, you will receive an A. If it is 80% or higher, you will receive at least a B. If it is 70% or higher, you will receive at least a C. I reserve the right to lower these thresholds (to your advantage) if the assessments turn out a bit more difficult than intended, but if you're looking to lock in a particular grade, these are your targets. This is the *only* information I will be able to provide on the cutoffs.

PREREQUISITES This course assumes knowledge of single-variable calculus, including limits, differentiation, and integration. However, I will rely as little as possible on the panoply of anti-differentiation techniques you've probably learned, opting to keep computations relatively simple and make the problems challenging in more conceptually and geometrically interesting ways.

EXAMS The midterm is tentatively scheduled for the **19th of October** during class. The final exam is scheduled for 14:00 to 17:00 on Sunday the **17th of December**. Detailed topics lists and practice exams will be made available for both exams. The practice exams will be representative in difficulty and format, but they will not comprehensively reflect the examinable topics.

We will be scanning your exams and uploading them into Gradescope. Accordingly, we will provide space in the back for extra work and ask that you **submit the pages of your exam exactly as they are given to you** (same order, same pages, including the ones in the back). You will be able to review your exam on Gradescope, and I encourage you to file a regrade request on Gradescope in the event that a solution is graded incorrectly.

Exams may not be submitted in the final 15 minutes of the exam period, so prepare to either turn your exam in before that time, or keep your exam until time has expired. Your exam will be marked on the basis of demonstrated understanding. This means that providing only an answer is not worth any credit (unless specifically requested in the problem statement), while a detailed solution might be worth almost full credit even if some mistake renders the final answer incorrect.

COLLABORATION AND ACADEMIC INTEGRITY You may collaborate on solving homework problems, but you must write your solutions entirely by yourself. On each homework submission, write a statement on the front page either listing collaborators or confirming that you did not collaborate. Using the internet to look up solutions to homework problems is not acceptable, although of course you may use any available resources to learn the material more generally.

CALCULATORS No calculators or other electronic devices are allowed (or necessary) for the exams. You may use calculators and computers for the homework, but do bear in

mind the exam policy when you choose how to incorporate computational assistance into your homework routine.

SYLLABUS You are required to submit a brief quiz on the contents of the syllabus, which is linked from the main course website. Yes, it's a little silly, but experience suggests that it will be helpful to make sure everyone is on the same page. It will take you probably less than a minute.

COURSE-RELATED WORK EXPECTATIONS Students will meet 3 hours per week in class (42 hours total). Homework and readings are estimated around 8 hours per week (125 hours total). In addition, there is a 3-hour final exam for which approximately 10 hours of review is assumed.

WHAT IS MATH? Most of us have experienced a mode of solving math problems that goes something like this: (1) see several similar examples solved out using some sort of formula or sequence of steps, (2) pick up on cues to recognize which numbers in the problem statement go where in the solution template, and (3) try our best to carry out these steps for the problem at hand. Hopefully you've also experienced problem solving that involves critical thinking and tightly integrates the manipulation of numbers and symbolic expressions with the physical or geometric concepts they represent. In this course, *we are very much going for this second mode.*

Engage your physical intuition early and often throughout the problem solving experience. Ask questions like *can I tell if the final answer will be positive or negative?* and *this expression increases as t increases; does that make sense if you look at the figure?* to establish frequent checks on your calculations and to develop your conceptual comprehension. I will model this style of thinking throughout the course, and I will compose the exams with the expectation that you are not trying to shoehorn the problems into a rote approach. It's more fun anyway, I promise.

DISABILITY SUPPORT Please inform me if you have a disability or other condition that might require modification of these procedures. I am happy to accommodate your learning needs. You should also contact the Student and Employee Accessibility Services at 401-863-9588 or SEAS@brown.edu.