GOSHEN COLLEGE
MATHEMATICS DEPARTMENT
MATH 212 CALCULUS II – SPRING 2022-23

Content

In a prior calculus course, you learned about derivatives and definite integrals—what they are, how they can be calculated symbolically, how they can be estimated graphically and numerically, and how they can be used in simple applications. In this course, we will develop the ideas of single variable calculus more rigorously and comprehensively. With this deeper understanding, you will become more adept at thinking critically, solving problems, and applying mathematics to other disciplines.

Catalog Description

Theory and applications of single variable calculus with an emphasis on writing clear explanations and proofs. Topics include real numbers, limits, derivatives, integrals, antidifferentiation techniques, function approximation, sequences, and series. Prerequisite: A grade of C or higher in Math 211 or an equivalent course. (4 credit hours)

Learning Objectives

The student will

1. State and use definitions and theorems about real numbers, limits, continuous functions, derivatives, antiderivatives, differential equations, definite integrals, sequences, and series;
2. Interrelate and use symbolic, graphical, numeric, and verbal representations of calculus concepts and techniques to model scenarios, solve problems, prove theorems, and resolve conjectures;
3. Use technology to investigate, visualize, and solve calculus problems;
4. Learn mathematics by reading, listening, exploring, and conversing in an effective manner;
5. Explain mathematical reasoning through writing in a precise and articulate manner in both informal and formal settings; and
6. Exhibit curiosity, playfulness, creativity, confidence, perseverance, interest in multiple perspectives, and a collaborative spirit.

Activities

The study of mathematics is not a spectator sport! Reading, listening, solving problems, writing explanations, reflecting upon ideas, and receiving feedback are essential to learning mathematics. Read with paper and pencil in hand, and take an anticipatory approach: try to obtain solutions, explanations, and proofs before reading what the author provides. Write down specific questions when you do not understand a portion of the text or a lecture. Try to recreate the key ideas, solve problems, and write proofs without looking at the book or notes.

Moodle will announce what should be read and done in preparation for class. Class time will be devoted to activities intended to deepen and extend your understanding. The homework assignment should solidify your knowledge and strengthen your ability to apply that knowledge. In the lab, you will work on a variety of mini-projects involving investigation, collaboration, and report writing. There will be three midterm exams and a cumulative final exam that will help you synthesize.

An average student can obtain an average grade with an average of twelve hours each week devoted to this 4-credit hour course (including class and lab time)—adjust if you are not average or desire a grade that is not average.

Instructor

David Housman, SC 117, dhousman@goshen.edu, 535-7405
See office door or Moodle for availability.

Class Time

MWF 12:00pm – 12:50pm in SC 107. R 12:30pm – 1:45pm in GL 102.

Textbook *APEX Calculus, Volumes 1-3 for Quarters*, ISBN: 978-1722973179, 978-1722973360, and 978-1722973445. These can be obtained as pdfs for free from http://www.apexcalculus.com/.

On-line Moodle https://moodle.goshen.edu contains all course information. Announcements posted to the forum will be emailed to all students. When necessary, David Housman's Zoom Link will be used for remote students during class and office hours.

Software Sage (sagemath.org) and its collaborative notebook interface CoCalc (cocalc.com) will be used for computation and report writing. Free basic private server access will be provided.

Notebook A three-ring binder with loose-leaf lined and graph paper is recommended so that you can keep a written record of problem-solving attempts, questions, math discoveries, and skill assessments.

Grading Course grades will be based on performance on homework (15%), labs (20%), three midterm exams (45%), and a comprehensive final exam (20%). If helpful, the final exam grade will replace one of the midterm exam scores. Attendance and participation in class activities can result in an adjustment in your homework grade.

Homework Assignments Achieve and exhibit understanding by completing the assigned exercises. Your solutions will be evaluated on the correctness of your mathematical descriptions and arguments, the clarity of your writing, and the quality of your presentation, including the judicial use of clearly labeled diagrams.

It may be helpful for you to distinguish between the process of figuring out an exercise and the process of writing up your results. Normally, what a person writes down during the process of figuring out an exercise is not sufficiently clear or complete for another person to read and understand, unless they have already done the same exercise. Imagine that your audience is a student taking a similar calculus class at a different college who does not happen to have a copy of the book in their hands, and write up the results of the exercise in a clear and readable form.

Some basics on writing clearly: Restate the question as a claim that can be understood on its own. Write in complete sentences. Define any variables that you use. Consider computations and drawings as supplemental to your verbal description of the mathematics. If you include a lengthy computation or a drawing, describe it verbally. Check for spelling, grammar, punctuation, and readability.

Some basics on presentation: Write your name and the assignment number on the front page. Staple all the pages of your homework into one neat packet. Trim the frayed edges of paper with scissors. Write neatly, and make sure that there is adequate space between exercises. If your handwriting is illegible, use a word processor. If a mathematical expression is longer than a long word, put it on a line by itself. If you include a drawing or a graph, make sure it is clearly labeled.

Homework assignments are typically due at the *start* of the class after the class during which the corresponding topic was discussed. During the first half of the semester, individual exercise solutions can be resubmitted or submitted late by the class period after the first submissions are graded and returned to students, but a 30% penalty will be assessed on these resubmissions and late submissions. When resubmitting work, include the originally graded work.

You are encouraged to collaborate and seek assistance when having difficulties. You will have achieved the expected level of understanding when you are able to obtain your own solutions, independently reproduce solutions developed in collaboration or with assistance, and/or explain a solution to others.

Extra Credit

Receive 10 or more points extra credit toward your assignments grade for each one of the following:

- fill out a course survey or evaluation;
- attend a quantitative activity (e.g., Science Speakers) and describe in no more than one page some interesting mathematical aspect of the activity, or participate in a Career Networks event and describe your most important discovery (limit 10);
- attend a study session (limit 10); or
- visit David's office with a question about the course (limit 3).

Labs

Apply your understanding to more open-ended exercises. Make effective use of software to explore concepts and solve problems. Practice communicating quantitative ideas in writing. Lab assignments will be started during the scheduled lab time but will require extra time outside of the lab period to complete. Lab reports will typically be due the Wednesday after the lab period and be completed by groups of one to three students. Resubmissions may be permitted.

Exams

Exhibit your mastery of the learning objectives without assistance or collaboration. There may be both in-class and take-home portions for each exam.

Study Sessions and Tutoring

Asa Schiller will be the Student Teaching Assistant (STA) for this course. Asa will have regularly scheduled study sessions open to every student in this class. This is a great time and place to work on exercises, share your ideas with other students, ask questions, and try to answer questions. The Academic Success Center provides limited tutoring and writing support for free to all undergraduate students. Make an appointment at tutorcal.goshen.edu.

Disability Services

Goshen College is committed to providing all students equal access to programs and facilities. Students who need accommodations based on disability should contact Judy Weaver, coordinator of access services. You can contact Judy by visiting the Academic Success Center (ASC) in the library, emailing jweaver@goshen.edu or calling 574-535-7560. Students must register with ASC before faculty are required to provide reasonable accommodations. To ensure that learning needs are met, contact the coordinator of access services by the first week of classes.

Collaboration and Academic Integrity

You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.

For homework and labs, you may look at and discuss another student's work, but any written work developed during collaboration with another student should be destroyed before writing your own solutions. You should give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful.

For exams, you may *not* use any resources unless a specific exception is stated by the instructor.

Failure to observe the above rules will result in a zero on the assignment or exam. Any violation of academic integrity will be reported to the Academic Dean. Observation of the above rules will help you learn the material well and give you the satisfaction of knowing that you have earned your grade.

Due Date Policy	Class participation, assignments, labs, and exams can only be excused, rescheduled, or made up if (1) there is a serious medical problem, a death in the immediate family, or an irreconcilable conflict with another official Goshen College activity; (2) there is written documentation signed by proper authorities; and (3) the instructor is notified prior to the due date or as soon as possible afterwards.
Course Materials are for Private Use	Course materials (videos, assignments, exams, problem sets, etc) are for use in this course only. You may not upload them to external sites, share with any person outside this course, or post for public commentary without written permission from the professor. Sharing recordings outside of the class could lead to a copyright or FERPA violation. Goshen College prohibits any student from duplicating, downloading, or distributing class recordings with anyone outside of this class for any reason.