Math 2110Q – Multivariable Calculus (Fall 2026)

Note: The policies listed here apply to all sections taught by Professors Anthony Rizzie, Andrew Davis, and Sarah Ghazawneh. For the section taught by Chinmay Dharmendra, please see your HuskyCT course and the syllabus provided there.

Description

Two- and three-dimensional vector algebra, calculus of functions of several variables, vector differential calculus, line and surface integrals.

Prerequisites

MATH 1132Q or MATH 1152Q or a score of 4 or 5 on the AP Calculus BC exam. Recommended preparation: a grade of C- or better in MATH 1132Q. May not be taken for credit after passing MATH 2130Q or MATH 2143Q. May not be taken out of sequence after passing MATH 2720, 3146, 3160, 3330, 3370, 3410, 3412, 3510, or 3610. Repeat restrictions apply; see advising.uconn.edu/repeat-policy.

Course Objectives

By the end of the semester, students should be able to:

1. Use three-dimensional Cartesian coordinates (including vectors and vector operations) to classify and distinguish between common equations and graphs of surfaces and curves.
2. Evaluate first and second partial derivatives of a multivariable function and relate these functions and their values to the behavior of a surface.
3. Use partial derivatives to determine equations of tangent planes, to locate and to classify critical points, and to calculate a rate of change of a surface in any direction.
4. Identify points in two-dimensional (Cartesian and polar) and three-dimensional (Cartesian, cylindrical, and spherical) coordinate systems and express common equations of surfaces and boundaries of regions in each system.
5. Write, reorder, evaluate, and interpret double and triple integrals of regions in the plane and space, respectively.
6. Set up, evaluate, and interpret line integrals of a scalar function or vector field over a given curve, applying famous results like the Fundamental Theorem for Line Integrals and Green's Theorem when appropriate.

7. Set up, evaluate, and interpret surface integrals of a scalar function or vector field over a given surface, applying famous results like Stokes' Theorem and the Divergence Theorem when appropriate.

Text

Calculus Volume 3 via Open Stax is a tremendous (and free!) resource for this course:

https://openstax.org/books/calculus-volume-3/pages/1-introduction

The sections that we currently reference follow in number and title with the unofficial (and not required) textbook *Calculus: Early Transcendentals* (9th Edition) by James Stewart.

Lecture

This semester, sections 120, 140, 160, and 180 have in-person lectures each week, but section 100 is completely online and asynchronous. All discussion sections meet in-person for **every** class. We will also make a complete set of lecture videos, developed through e-campus by Prof. Anthony Rizzie, available as an extra resource.

Note: If you are in the online section (section 100), then it is **crucial** to regularly read announcements and your email. Please plan to check at least twice per day!

Practice Problem Points (PPP)

One of the best ways to reinforce your skills and gain a thorough understanding of the course material is by completing problems. There are several types of practice problems available to you in the course – Weekly Worksheets, Extra Practice Worksheets, etc. Each one you complete will earn you PPP. **You are expected to earn 100 PPP throughout the course, and your final grade for this category will be your total taken as a percentage out of 100 total points.** You will, however, be allowed to earn up to 110 PPP total, and anything above 100 PPP will count as extra credit in the course. Any points earned beyond 110 PPP will not count toward your final grade.

There is an alternate grading scheme where PPP counts as 0% of your final grade and exams count as the entire grade, but we **HIGHLY** recommend doing PPP. Doing practice problems is the best way to learn the course material!

Quizzes (up to 3 PPP each quiz, 33 total)

Each Friday in Discussion, we will offer a quiz that will have two short-answer questions. The quiz will always cover the previous week's material. You will receive 1 PPP automatically

for submitting the quiz with any work, and the other 2 PPP are based on correctness for each question on the quiz. Each quiz will be 10 minutes in length; this may not be enough time for you to finish the quiz, and that is ok! The point is primarily to self-assess your own knowledge and understanding. We understand that life happens and that you may not always be able to attend discussion (being sick, family emergencies, etc.), but we will not be offering any makeup quizzes due to the ample opportunities to earn PPP in the course. The quizzes and solutions will be posted following the day each quiz is given (it may not get posted until the following Monday, please be patient!).

Weekly Worksheets (up to 5 PPP each week, 70 total)

There are weekly worksheets that cover the material from each week of the course posted on HuskyCT. Each worksheet has three parts. The first part (labeled Practice Problems) can be submitted in HuskyCT by Thursday night of the week after the material is covered. You will earn 3 PPP for completing these problems and submitting them on time. You are welcome to print out the worksheet and do your work on there if necessary, but using your own lined paper and submitting a picture or scan of your work is greatly preferred and easier to read!

Note: "Complete" means that all parts of the problem are finished and that an earnest attempt was made at solving EVERY problem. Simply writing something down or doing a step or two does not constitute a full, good-faith solution attempt and will not receive completion credit. If you do not finish the entire worksheet, then it is not counted for full points!

The worksheets also have problems labeled Extra Quiz Practice. Solutions to these problems are immediately available in order to give you some more examples of completed problems. These problems **CANNOT** be completed for credit. You do **NOT** need to submit work for these problems, but you are encouraged to do them for practice!

The third part is labeled Challenge Problems. **You may complete and submit up to 2 Challenge problems each week for 1 PPP each**. These problems will be submitted with the main worksheet problems on HuskyCT.

Weekly Worksheets are due Thursday nights. Worksheets will **NOT** be accepted late.

Summary:

Practice Problems- Turn these in on HuskyCT by Thursday at 11:59 PM for 3 PPP. Practice problems are not accepted late.

Extra Quiz Practice- These are never submitted for points.

Challenge Problems- Turn these in on HuskyCT by Thursday at 11:59 PM for up to 2 PPP. Challenge problems are not accepted late.

Additional Practice Worksheets (up to 3 PPP each worksheet, 60 total)

Additional Practice Worksheets are provided under the Outline tab above and in HuskyCT. These are intended to help you practice and master both the concepts and calculations for this course. Worksheets can be submitted to HuskyCT and earn 3 PPP each if fully completed. Additional Practice Worksheets are due on the day of each corresponding exam, and they can serve as an excellent resource for studying and exam prep! They can also be submitted earlier but may not be graded until closer to the due date, so please be aware of this when looking at your current PPP score/total.

Participation in Discussion Section (up to 1 PPP each week, 14 total)

At your TA's discretion, you may earn up to 1 PPP a week by actively participating during discussion section. Please speak with your TA about the specific way you will be able to earn these points in your discussion section as this is allowed to vary by discussion section/TA.

Calculus Corner (1 PPP each Calculus Corner attended)

Calculus Corner is a space where you can drop in to work with your classmates on your homework and worksheets, study for upcoming exams, get help from TAs, and earn PPP at the same time! Be sure to check in to get your participation recorded for PPP credit.

The Fall 2026 hours for Calculus Corner will be MWF 8:30 am-12:30 pm and TuTh 1-5 pm. Some of these hours will be open to only 1131Q students, and when we know which hours those are, we will update the schedule accordingly!

Practice Exams (5 PPP each practice exam, 15 total)

We will host and provide a practice exam for each of the three exams in the course. If you fully complete the practice exam, you will earn 5 PPP for each of three times throughout the semester. Your work for the practice exams will be submitted on HuskyCT in order to earn PPP credit, whether you attend the practice exam in-person or not.

Exams

There will be three exams (dates below). Each exam is a mixture of True/False, matching, multiple-choice and free-response questions. You have 50 minutes to complete each exam. These must be completed in-person during your assigned discussion section time. If you think you may have to miss an exam for any reason, email your instructor **IMMEDIATELY**; please do not wait until the day of the exam or later if at all possible! Makeup exams will be considered within one week of the date each exam is given but no later.

Midterm Exam Format

All midterm exams will be given in discussion section (in-person). Exams will be a mix of True/False, Multiple choice, Fill in the Blank and/or free response questions. You have 50 minutes for each exam. Exams must be completed during your discussion section time.

You will be allowed to write and use a note sheet for each exam. Notes should be handwritten on paper or handwritten on a tablet and printed at 1:1 scale, and the page may not exceed a standard 8.5×11 sheet of paper. Study resources are provided in HuskyCT.

Exam 1

- Week 5: Friday, October 2nd
- Covers 12.1-12.6, 14.1-14.8 (omit 14.2)

Exam 2

- Week 9: Friday, October 30th
- Covers 15.1-15.9 (omit 15.4, 15.5)

Exam 3

- Week 14: Friday, December 11th
- Covers 13.1-13.3, and 16.1-16.7

Final Exam

The final exam is optional but will be cumulative and given during the final exam period of finals week (typically Wednesday afternoon). Taking the final exam cannot hurt your grade in the course; however, if you score better on the final exam than on your lowest of the three midterm exams, then we will replace the score of the lowest exam with that of the final. Multiple exam scores will not be replaced- only the lowest score can be replaced once.

Late Work Policy

If you need to submit work late, then please contact your instructor. We will generally expect students to meet the deadline listed above and take exams on time, but we understand that sometimes events out of your control happen. Please reach out to us, and we will do our best to work with you in a way that is consistent, compassionate, and fair. **Do not wait until the last week of the course to discuss grade issues!** The sooner we are aware of issues, the more able we will be able to help you. It is very unlikely you will be able to make up an exam once it is returned, for example.

If you are sick, please make every effort possible to tell your instructor **BEFORE** an exam or due date. If this is not possible, make contact as soon as possible, even just to say you are sick and will get in touch as soon as you feel better.

In the event that you need to make up an exam, please send an email to your instructor and copy your TA. This decision will be made by your instructor.

Extra Credit: There will be a few opportunities to earn bonus points on individual assignments, for example, on exams. All bonus point opportunities will be given to ALL students in the class. Extra Credit is NOT given to individual students. Individual requests for extra credit or to make up work that is long past due will not be granted.

Requests to change your grade after the end of the term will be ignored, except in the case that we have made a clerical or calculation error, as UConn does not allow grade changes for any other reason after final course grades are submitted. Please be proactive and make a plan for success in the course, and should any issues arise during the semester, speak with your instructor right away.

Grading

		Scheme 1	Scheme 2
Practice Problem Points (PPP)	Quizzes, Weekly Worksheets, Additional Practice Worksheets, etc, out of 100 points	10%	0%
Exam 1: (Friday, October 2nd)	During Discussion Section (in-person)	30%	30-40%*

Exam 2: (Friday, October 30th)	During Discussion Section (in-person)	30%	30-40%*
Exam 3: (Friday, December 11th)	During Discussion Section (in-person)	30%	30-40%*

***Note on Alternate Grade Schemes:** We will consider your final grade two ways: 1) where PPP counts as 10% and each of the three exams are weighted as 30%, and 2) where PPP counts as 0% and each of the three exams are weighted as either 30% or 40% (your best exam score will count as 40%, other 2 at 30%), and we will give you the higher grade using both computations. This will be done automatically for all students.

Honors Section

If you are in the Honors discussion section, then one or more aspects of your grade may be slightly different. Your instructor will provide more information in your class.

Letter Grade Table

Grade	Letter Grade	Grade Points (per Credit) towards GPA
93-100	A	4.0
90-92.99	A-	3.7
87-89.99	B+	3.3
83-86.99	B	3.0
80-82.99	B-	2.7
77-79.99	C+	2.3
73-76.99	C	2.0
70-72.99	C-	1.7
67-69.99	D+	1.3
63-66.99	D	1.0

60-62.99	D-	0.7
<60	F	0.0

How to Study for This Course:

1. Attend in-person lecture and discussion section meetings. Be actively engaged.
2. Complete all worksheet problems.
3. Read the explanations and examples in the textbook.
4. Do the online homework in a timely manner. Don't start it late and rush through it; you may not finish it, and you won't learn much this way.
5. Ask questions. Attend office hours and Calc Nights. Reach out if you need help, early and as often as needed!
6. Watch supplementary videos on the material to see and work with more examples. These can be found in HuskyCT on the Learning Activities table below.
7. Use technology as an interactive tool to learn and explore the properties of surfaces and vector fields. A few helpful links can be found on the Learning Activities table below.
8. Do problems that you have not previously done and/or do problems without knowing what section they came from. For example, if you do a problem from Section 15.8, then you already know that it would be a good idea to use spherical coordinates. If you are instead given a triple integral to set up or evaluate without any knowledge of the section it came from, you have to decide if you should use Cartesian, cylindrical, or spherical coordinates, which is significantly better for your studying and mastery of the topics.

Schedule of Topics

Week	Sections Covered	Topic	Additional Practice Worksheets
1	12.1 12.2 12.3 12.4	Three-Dimensional Coordinate Systems Vectors The Dot Product The Cross Product	Calculus I and II Review.pdf 12.2 Vectors Notes.pdf (12.2 solutions.pdf) Practice with Vectors.pdf (solutions.pdf)
2	12.5 12.6	Equations of Lines & Planes Cylinders and Quadric Surfaces	Understanding Surfaces.pdf
3	14.1 14.3 14.4 14.5	Functions of Several Variables Partial Derivatives Tangent Planes and Linear Approximation The Chain Rule	Lines and Planes.pdf 14.5 The Chain Rule Notes.pdf (14.5 solutions.pdf)
4	14.6 14.7 14.8	Directional Derivatives & the Gradient Vector Maximum and Minimum Values Lagrange Multipliers	Tangent Planes and Directional Derivatives.pdf Classifying Critical Points.pdf 14.8 Lagrange Multipliers Notes.pdf (14.8 Solutions.pdf)
5	**EXAM 1** 15.1 15.2	Covers Ch 12 and 14, (during discussion) Double Integrals over Rectangles Double Integrals over General Regions	Double Integrals and Volume.pdf
6	15.3 15.6	Double Integrals in Polar Coordinates Triple Integrals in Cartesian Coordinates	Double Integrals in Polar Coordinates.pdf (solutions.pdf) Cartesian Triple Integrals.pdf

7	15.7 15.8	Triple Integrals in Cylindrical Coordinates Triple Integrals in Spherical Coordinates	Cylindrical Triple Integrals.pdf Spherical Triple Integrals.pdf
8	15.9	Change of Variables in Multiple Integrals	15.9 Change of Variables Notes.pdf (15.9 solutions.pdf)
9	**EXAM 2** 13.1 13.2 13.3	Covers Ch 14 and 15 (during discussion) Vector Functions Derivatives & Integrals of Vector Functions Arc Length	Vector Functions and Parameterized Curves.pdf
10	16.2 16.1 16.2	Line Integrals (Scalar Functions) Vector Fields Line Integrals (Vector Fields)	Line Integrals.pdf
11	16.3 16.4	The Fundamental Thm for Line Integrals Green's Theorem	Line Integral Theorems.pdf
12	16.5 16.6	Curl and Divergence Parametric Surfaces and Their Areas	Curl and Divergence.pdf Common Parametric Surfaces.pdf
—		**THANKSGIVING RECESS**	**NO CLASSES**
13	**EXAM 3** 16.7 16.8	Covers Ch 15, 13 and 16.1-6 (during discussion) Surface Integrals (Scalar and Vector Functions) Stokes' Theorem	Line Integrals vs. Surface Integrals.pdf.pdf
14	16.9	Divergence Theorem	Using the Divergence Theorem.pdf
		Finals Week	Final Portfolio Due Monday 12/8

Calculator Policy:

Calculators are **NOT** allowed during exams. You are welcome to use calculators while working on worksheets or WebAssign assignments. Using a calculator on a quiz or exam will result in a warning or a penalty, which could include a score of zero on that quiz or exam and being reported to Community Standards for academic misconduct.

Academic Integrity

"A fundamental tenet of all educational institutions is academic honesty. Academic work depends upon respect for and acknowledgement of the research and ideas of others. Misrepresenting someone else's work as one's own is a serious offense in any academic setting and it will not be condoned." A student who knowingly assists another student in committing an act of academic misconduct shall be equally accountable for the violation, and both shall be subject to the sanctions and other remedies. See the Uconn Student Code, Appendix A.

All students shall act in accordance with the Student Code at the University of Connecticut, which states that: "Academic misconduct is dishonest or unethical academic behavior that includes, but is not limited to, misrepresenting mastery in an academic area (e.g., cheating), failing to properly credit information, research, or ideas to their rightful originators or representing such information, research, or ideas as your own (e.g., plagiarism)." In particular, this means that any work you submit in this course should be your own.

It is expected that you will struggle with various aspects of this course, and you are encouraged to seek help from me, your peers, the Q Center, and other sources in understanding the concepts and computations. **However, you are expected to turn in work that reflects your own understanding of the topics and ideas. Therefore, your work should not bear resemblance to that of any other student in the course or to any other sources used, and any ideas used for which any other party had a share in developing should be cited as such.**

For example, it is a good idea to look at examples in the text, notes, or online for problems similar to the one you are stuck on, and looking for ways to adapt the ideas and methods to your current problem. **In the interest of both your learning and academic honesty, I do not recommend searching for solutions to the specific problem you are stuck on. Be sure to follow the specific guideline on each assignment. If an assignment says you can't search the web for those problems, then searching for those problems will be considered an academic integrity violation.**

While you may look online for help understanding concepts, **you may not view solutions to specific assigned problems (or small variations to these problems), either from other students or via AI tools like ChatGPT or Copilot or on paid sites like Chegg or Bartleby.** You may use Calculus Corner, Office Hours, and other free outside resources like Khan Academy and YouTube. This means that if you use these allowed resources, even just for a push in the right direction, you should mention that you used them and then still write the solution in our own words to reflect your own understanding.

On proctored assessments like discussion quizzes and exams, it is expected that all work submitted is your own and is done during the proctored assignment. These answers should reflect your current understanding. In particular, you should be able to explain your reasoning on any problem, if asked. Memorizing solutions and then reproducing them without understanding is not an acceptable procedure. Additionally, you may not access any unauthorized resources during proctored quizzes or exams. You may not relay exam information to other students in the class prior to completing the quiz or exam.

Consequences of academic misconduct include, but are not limited to, a zero on the assignment or exam and/or a grade of F in the course. If you are unsure that what you are doing to complete the work of this course is acceptable, contact the instructor for helpful tips and advice on how to protect your work and ensure that you are not violating the academic integrity policies of the instructor, the course, or the university.

Student Support Services

- **Dean of Students** 486-3426 The office serves as an advocate for students and as a centralized resource for connecting students with appropriate university and community programs, offices and individuals. The office supports students in resolving educational, personal and other university concerns that affect the quality of their academic or community life and personal goals.
- **Center for Students with Disabilities** 486-2020 (voice), 486-2077 (TDD) The Center for Students with Disabilities (CSD) at UConn provides accommodations and services for qualified students with disabilities. If you have a documented disability for which you wish to request academic accommodations and have not contacted the CSD, please do so as soon as possible.
- **Counseling and Mental Health Services** 486-4705 (after hours, use 486-3427)
- **Alcohol and Other Drug Services** 486-9431
- **Career Services** 486-3013
- **Q Center:** The Q Center offers free tutoring for this course in an online setting. See the schedule on their website for the times when there are tutors who can help with 2110.

Additional Course and Course Support Information

Feedback and Grades

We will make every effort to provide feedback and grades within a week of your submissions. To keep track of your performance in the course, refer to My Grades in HuskyCT and WebAssign. Most grades will be kept in your lecture section HuskyCT page.

Weekly Time Commitment

You should expect to dedicate at least 8-10 hours each week to this course, in addition to attending lecture and discussion class meetings. This expectation is based on the various course activities, assignments, and assessments and the University of Connecticut's policy regarding credit hours.

Husky Study Groups

Are you interested in forming a study group with other students in the class? There is a study group application in Nexus that can help you get started. Check out this video and go here for more information.

Resources for Students Experiencing Distress

The University of Connecticut is committed to supporting students in their mental health, their psychological and social well-being, and their connection to their academic experience and overall wellness. The university believes that academic, personal, and professional development can flourish only when each member of our community is assured equitable access to mental health services. The university aims to make access to mental health attainable while fostering a community reflecting equity and diversity and understands that good mental health may lead to personal and professional growth, greater self-awareness, increased social engagement, enhanced academic success, and campus and community involvement. Students who feel they may benefit from speaking with a mental health professional can find support and resources through the **Student Health and Wellness-Mental Health** (SHaW-MH) office. Through SHaW-MH, students can make an appointment with a mental health professional and engage in confidential conversations or seek recommendations or referrals for any mental health or psychological concern. Mental health services are included as part of the university's student health insurance plan and also partially funded through university fees. If you do not have UConn's student health insurance plan, most major insurance plans are also accepted. Students can visit the **Student Health and Wellness-Mental Health located in Storrs on the main campus**

in the Arjona Building, 4th Floor, or contact the office at **(860) 486-4705, or** **https://studenthealth.uconn.edu/** for services or questions**.**

Accommodations for Illness or Extended Absences

Please stay home if you are feeling ill and please go home if you are in class and start to feel ill. If illness prevents you from attending class, it is your responsibility to notify your instructor as soon as possible. You do not need to disclose the nature of your illness, however, you will need to work with your instructor to determine how you will complete coursework during your absence. If life circumstances are affecting your ability to focus on courses and your UConn experience, students can email the Dean of Students at dos@uconn.edu to request support.

Students with Disabilities and Special accommodations

The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or http://csd.uconn.edu/. Student Athletes and Students with Disabilities should inform your instructor of your commitments as an athlete, any special needs that you have, etc. within the first three weeks of the semester. You will be expected to bring in a letter from the Athletics Department or the Center for Students with Disabilities. The University Senate passed a motion on about religious observances which stipulated that Students anticipating such a conflict should inform their instructor in writing within the first three weeks of the semester, and prior to the anticipated absence, and should take the initiative to work out with the instructor a schedule for making up missed work. For conflicts with final examinations, students should, as usual, contact the Dean of Students.

Student Responsibilities and Resources

As a member of the University of Connecticut student community, you are held to certain standards and academic policies. In addition, there are numerous resources available to help you succeed in your academic work. Review these important standards, policies and resources, which include:

- The Student Code
    - Academic Integrity
    - Resources on Avoiding Cheating and Plagiarism

- Copyrighted Materials
- Credit Hours and Workload
- Netiquette and Communication
- Adding or Dropping a Course
- Academic Calendar
- Policy Against Discrimination, Harassment and Inappropriate Romantic Relationships
- Sexual Assault Reporting Policy

Software/Technical Requirements (with Accessibility and Privacy Information)

The software/technical requirements for this course include:

- HuskyCT/Blackboard (HuskyCT/ Blackboard Accessibility Statement, HuskyCT/ Blackboard Privacy Policy)
- Adobe Acrobat Reader (Adobe Reader Accessibility Statement, Adobe Reader Privacy Policy)
- Outlook and OneDrive (Microsoft Accessibility Statement, Microsoft Privacy Policy)
- Dedicated access to high-speed internet with a minimum speed of 1.5 Mbps (4 Mbps or higher is recommended).
- Gradescope (Privacy Policy, Accessibility Statement)

For information on managing your privacy at the University of Connecticut, visit the University's Privacy page.

Help

Technical and Academic Help provides a guide to technical and academic assistance. This course uses the learning management platform, HuskyCT. If you have difficulty accessing HuskyCT, you have access to the in person/live person support options available during regular business hours through the Help Center. You also have 24×7 Course Support including access to live chat, phone, and support documents.

Minimum Technical Skills

To be successful in this course, you will need the following technical skills:

- Use electronic mail with attachments.
- Save files in commonly used word processing program formats.
- Scan handwritten work to PDFs.
- Copy and paste text, graphics or hyperlinks.
- Work within two or more browser windows simultaneously.

- Open and access PDF files.

University students are expected to demonstrate competency in Computer Technology. Explore the Student Guide to UConn Technology page for more information.

Evaluation of Course Experience

Students will be given an opportunity to provide feedback on their course experience and instruction using the University's standard procedures, which are administered by the Office of Budget, Planning, and Institutional Research (BPIR). The University of Connecticut is dedicated to supporting and enhancing teaching effectiveness and student learning using a variety of methods. The Student Experience of Teaching (SET) survey is just one tool used to help faculty enhance their teaching. The SET is used for both formative (self-improvement) and summative (evaluation) purposes. Additional informal formative surveys and other feedback instruments may be administered within the course.

Additional Course Resources and Learning Activities

A Few Useful Links:

Paul's Online Math Notes, Calculus III

GeoGebra 3D Calculator

3D Function Graphing Tool (also does Parametric Surfaces!)

2D Vector Field Generator

GeoGebra Resources:

Graphing with GeoGebra.pdf: Intro to GeoGebra

Surfaces.pdf: Have a look at the equations and graphs of common surfaces

https://www.geogebra.org/3d/s52k8uur: Visualizing Traces and Partial Derivatives

Tangent Plane Demo.pdf: Visualize Tangent Planes and see their Connection to Partial Derivatives

Triple Integrals.pdf: See how to build up the domain of a triple integral and visualize if it is Type X, Y or Z.

Coordinate Systems.pdf: See how Cartesian, cylindrical and spherical coordinates work

https://www.geogebra.org/3d/unfhkaps:Line Integrals of Vector and Scalar Fields

https://www.geogebra.org/m/jb7z9wnb:Fundamental Theorem of Line Integrals

Collection of Demos.pdf: Student Selected Collection of Various Demos

Learning Activities By Textbook Section:

Section	Topic	Learning Activities
12.1	Three-Dimensional Coordinate Systems	Visualizing the Octants Points in 3D and Points in 3D (User Input) Corners of a Box Planes Circles vs Cylinder/Line vs Plane
12.6	Cylinders and Quadric Surfaces	Quadric Surfaces

		Notes on Sketching and Identifying Surfaces.pdf Surfaces.pdf: Have a look at the equations and graphs of common surfaces in GeoGebra
12.2	Vectors	Visualizing Vectors in 3D Vector Addition and Commutative Properties Vector Components Unit Vectors and Normalization
12.3	The Dot Product	Dot Products in 3D Direction Angles (*useful application) Projections (*useful application)
12.4	The Cross Product	Cross Products Volume of a Parallelepiped (*useful application)
12.5	Equations of Lines & Planes	Line in 3D (static) vs Line in 3D (variable) Planes and Intercepts of Planes An Example Relating Lines and Planes.pdf
14.1	Functions of Several Variables	A Gallery of Examples Level Curves of an (Elliptic) Paraboloid Level Curves of a Gaussian Surface (Bell)
14.2	Limits and Continuity (*interesting topic, neither covered in class nor on exams)	Limits Handout.pdf
14.3	Partial Derivatives	Cross Sections https://www.geogebra.org/3d/s52k8uur: Visualizing Traces and Partial Derivatives in GeoGebra
14.4	Tangent Planes and Linear Approximation	Linear Approximation Tangent Plane Demo.pdf: Visualize Tangent Planes and see their Connection to Partial Derivatives in GeoGebra
14.5	The Chain Rule	Chain Rule Practice Exercises (with Solutions).pdf

14.6	Directional Derivatives and the Gradient Vector	Directional Derivatives
14.7	Maximum and Minimum Values	Types of Extrema
14.8	Lagrange Multipliers	Lagrange Multipliers Practice Exercises (with Solutions).pdf Lagrange Multipliers Example Graph in Desmos 3D
15.1	Double Integrals over Rectangles	Riemann Sum in 2D Riemann Sum in 3D
15.2	Double Integrals over General Regions	
15.3	Double Integrals in Polar Coordinates	
15.6	Triple Integrals	Modeling Solids Handout (Play-Doh!).pdf Triple Integrals.pdf: See how to build up the domain of a triple integral and visualize if it is Type X, Y or Z in GeoGebra
15.9	Change of Variables in Multiple Integrals	Change of Variables Practice Exercises (with Solutions).pdf
15.7	Triple Integrals in Cylindrical Coordinates	Visualizing Cylindrical Coordinates
15.8	Triple Integrals in Spherical Coordinates	Visualizing Spherical Coordinates Basic Shapes in Spherical Coordinates Spherical Coordinates on GeoGebra (use slider bars at top left to change variables) Summary of Triple Integrals (All Coordinate Systems).pdf Coordinate Systems.pdf: See how Cartesian, cylindrical and spherical coordinates work using GeoGebra

13.1	Vector Functions	A Space Curve Another Space Curve (Helix) Line Segment A Gallery of Examples
13.2	Derivatives and Integrals of Vector Functions	
13.3	Arc Length	Linear Approximation of Arc Length Practice Problems with Visualizations
16.2	Line Integrals (Scalar Functions)	
16.1	Vector Fields	Simple 2D Vector Field Interesting 2D Vector Field Simple 3D Vector Field Interesting 3D Vector Field
16.2	Line Integrals (Vector Fields)	https://www.geogebra.org/3d/unfhkaps:Line Integrals of Vector and Scalar Fields in GeoGebra
16.3	The Fundamental Theorem for Line Integrals	https://www.geogebra.org/m/jb7z9wnb:Fundamental Theorem of Line Integrals in GeoGebra
16.4	Green's Theorem	Summary of Line Integrals (methods and deciding what to use).pdf
16.5	Curl and Divergence	The Idea Behind Curl Subtleties about Curl
16.6	Parametric Surfaces and Their Areas	A Gallery of Examples Parametric Surfaces (from URI)
16.7	Surface Integrals (Scalar Functions)	Practice Problems with Visualizations
16.7	Surface Integrals (Vector Fields)	
16.9	Divergence Theorem	

16.8	Stokes' Theorem	Summary of Surface Integrals (decision-making and methods).pdf