Calculus with Analytic Geometry I
MAC 2311 Lecture
4 Credit Hours
Summer 2025

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Prerequisites

Any of the following: Minimum acceptable score on the online mathematics placement exam (ALEKS), which is a 76 or higher; a grade of C in a MAC course numbered 1147 or higher; AP credit for MAC2311; IB credit for a MAC course numbered 1147 or higher. Any course grades, AP, or IB scores used to meet this prerequisite must be on file at UF by registration.

Course Description

In this course, students will develop problem solving skills, critical thinking, computational proficiency, and contextual fluency through the study of limits, derivatives, and definite and indefinite integrals of functions of one variable, including algebraic, exponential, logarithmic, and trigonometric functions, and applications. Topics will include limits, continuity, differentiation, and rates of change, optimization, curve sketching and introduction to integration and area. Introduces analytic geometric; limits; continuity; differentiation of algebraic, trigonometric, exponential and logarithmic functions; applications of the derivative; inverse trigonometric functions; differentials; introduction to integration; and the fundamental theorem of calculus. (M) Credit will be given for, at most, one of MAC 2233, MAC 2311, and MAC 3472.

General Education Objectives and Learning Outcomes

General Education Objectives provides a description of how the general education requirements are being met. See specifically the relevant mathematics (M) subject area description at the aforementioned link.

This course is a mathematics (M) course in the UF General Education Program. Completing this course with a minimum grade of C will satisfy the student's State Core Mathematics requirement of the UF General Education Program. Courses in mathematics provide instruction in computational strategies in fundamental mathematics including at least one of the following: solving equations and inequalities, logic, statistics, algebra, trigonometry, inductive and deductive reasoning. These courses include reasoning in abstract mathematical systems, formulating mathematical models and arguments, using mathematical models to solve problems and applying mathematical concepts effectively to real-world situations.

After successful completion of this course students will have demonstrated competency in the following Student Learning Outcomes (SLOs):

- **Content:** *Students demonstrate competence in the terminology, concepts, theories, and methodologies used within the discipline.* After completing this course students will gain a knowledge of limits, differentiation, and integration.
- **Communication:** *Students communicate knowledge, ideas, and reasoning clearly and effectively in written and oral forms appropriate to the discipline.* Throughout this course students will communicate mathematical ideas verbally in their discussion sessions and as well as through writing on discussion quizzes and exams.
- **Critical Thinking:** *Students analyze information carefully and logically from multiple perspectives, using discipline-specific methods, and develop reasoned solutions to problems.* Students will apply their knowledge to solve problems concerning topics that include, but are not limited to, differentiation techniques, calcuation of exact areas under curves, application of rates of change to physical examples of position, velocity and acceleration, identifying the limit of various functions, using the derivative as a tool for approximation through differentials and linear approximation, among countless other applications.

Student Learning Outcomes

After successful completion of this course students will have demonstrated competency in the following Student Learning Outcomes (SLOs):

- Students will calculate a limit, derivative, or integral using appropriate techniques.
- Students will determine the continuity and differentiability of a function.
- Students will use limits and derivatives to analyze relatonships between the equation of a function and its graph.
- Students will apply differentiation techniques to model and solve real world problems.
- Students will use integrals and the fundamental theorem of calculus to analyze the relationship between the integral of a function and the related area.

Required Materials

There are no required textbooks for this course. We will make use of a free online textbook available at Openstax Calculus Volume 1 as well as Stewart Calculus. A link to both are provided on our Canvas homepage.

E-Learning Canvas:

E-learning canvas, a UF course management system, is located at elearning.ufl.edu. Use your Gatorlink username and password to login. All course information including your grade, course homepage, syllabus, lecture outlines, office hours, test locations, mail tool, discussion forum, free help information, etc. can be accessed from this site.

You are responsible for verifying that your grades are accurate. **You have one week after a score has been posted to contact your TA if you believe there has been a recording error. There is no grade dispute at the end of the semester.**

Please note: Important course information is clearly communicated in this course guide, the MAC 2311 homepage and links in Canvas, and announcements in lecture and discussion. Due to the volume of email received by the instructor and TAs, we cannot reply to each request for this well publicized information. If you cannot find your answer in the resources above, there is also a **Discussion Forum** available in Canvas. Please use this to post questions and to supply answers to your fellow students. Primarily, we will use the discussion board to work together on homework problems and studying for the exam. Using these boards presents a bonus point opportunity as well.

E-mail

All communication between student and instructor and between students should be respectful and professional. All official class communications will be sent only to the ufl.edu addresses. Students are responsible for acquiring, checking their email accounts regularly, and any class information sent to their ufl.edu account. Please be sure to sign your name to your e-mails.

Lectures

Lectures will take the form of videos watched online via Canvas.

Lecture Quizzes

Immediately after you finish watching the lecture video, you should take the corresponding lecture quiz on the material covered that particular day. The three lowest online lecture quiz grades will be dropped at the end of the semester. You have three attempts on each online canvas quiz.

Tests

Mid-term exam dates are as follows:

Exam 1: Friday, May 1 6:30PM - 11:59PM

Exam 2: Friday, June 20 6:30PM - 11:59PM

Exam 3: Friday, July 18 6:30PM - 11:59PM

Final: Friday, August 8 6:30PM - 11:59PM

There will be three online midterms throughout the semester. The midterms will consist of two parts. Part 1 will be multiple choice questions. Part 2 of the midterm exams will consist of free response problems. You will need to upload a document showing your work for the free response problems.

These midterm exams will be available to take during the evening of the exam date, from 6:30 PM to 11:59 PM. Once you being the exam you will have 115 minutes to finish. For the final exam you will instead have 135 minutes.

Each midterm exam is worth 15% of your final grade while the final exam is worth 25% of your final grade. No exam grades will be dropped. **There are no exam retakes.**

Exam Policy

Please come to the exams prepared with pencils/mechanical pencils and your ID (UFID or other government issue ID). You may not use pen. You may not use a calculator. You may not have your phone out at all during the exam. If you are using your phone during the exam, this will be considered academic dishonesty and the issue will be escalated to the appropriate channels. There are no calculators allowed on exams.

Online Homework

Complete online homework and leture quizzes via our Canvas page. You can find all your work under the "assignments" section of Canvas, found on the left side of the home page. Go to the assignments section of canvas and complete assignments directly. Please double-check in the canvas gradebook that your scores are in fact recording. Reach out to me as soon as possible of any technical difficulties that may arise. If you encounter any techincal difficulties, you can attempt to clear browsing history and/or open the assignment in a new browser. You could also try using another device such as your phone, an ipad, or one of the on-campus library computer. If you feel these difficulties will impact your performance, please let your instructor know with advanced notice. Technical difficulties are not an excuse for missing an assignment. Please start your assignments early and give ample notice if you encounter issues. There are also many libraries that you can utilize to complete your online homework as well.
Please do not wait until the last minute to start your homework. There will be a total of **three** dropped online homework grades at the end of the semester.

All assignments will have posted due dates and will follow our pace in the course. Please keep up with the due dates of assignments using canvas. Late online assignments are flagged in the gradebook, but may be revisited up to the posted number of allowable attempts. Xronos HW is not accepted after the deadline.

Personal computer issues are NOT a valid reason for any type of extension. The same is true to multiple assignmnets being due in other classes at the same time. Manage your time wisely.

Class Participation

Students who actively participate are more likely to do well in the course. It is highly recommend to attend office hours via Zoom.

Make-up Policy

All make-up work must be arranged with the course coordinator.

• **Exam Conflicts - UF during Term Assembly Exam Policy** (catalog.ufl.edu/ugrad/current/regulations/info/exams.aspx): "During-term examinations are held during regular class times or during assembly exam periods, which are Monday-Friday from 8:20 - 10:10 p.m. (periods E2-E3) for the fall and spring terms and Monday-Friday from 7:00 - 9:45 p.m. (periods E1-E2) for the summer terms. If other classes are scheduled during an exam time, instructors must provide make-up class work for students who miss class because of an assembly exam. When two exams conflict, assembly exams (multiple sections and enrollment over 300) take precedence over non-assembly exams (single sections and/or enrollment under 300). If two assembly exams conflict, the course with the higher number will take priority. Likewise, if two non-assembly exams conflict, the higher number will again take priority. Instructors giving make-up exams will make the necessary adjustments. Students shall be permitted a reasonable amount of time to make up the material or activities covered in their absence. A reasonable amount of time to make up a during-term exam is before the end of the semester in which the student is enrolled in the class."
If MAC 2311 is the lower course number, students must inform the course coordinator at least ONE WEEK in advance of the exam date so that appropriate accommodations can be made. Otherwise it may not be possible to reschedule.

• **Make-up Exams** If you are participating in a UF sponsored event or religious observance, you may make up an exam only if you make arrangements with the course coordinator during the FIRST TWO WEEKS OF THE COURSE. You must present documentation of a UF sponsored event.
If illness or other extenuating circumstances cause you to miss an exam, contact the course coordinator (no later than 24 hours after the exam) by email. Then, as soon as possible after you return to campus, provide the appropriate documentation to the course coordinator. You will be allowed to sign up to take a makeup exam at the end of the semester.

• **Exam retakes** Under no circumstance will a student be allowed to take an exam twice to improve their score. Do not sit for an exam sick and then expect to take a retake as well.

• **Make-up online HW**: There are no make-ups. Please reach out to me with plenty of advance notice if you're having online HW issues. Technical issues the day before the homework is due is not an excuse. Late online assignments will be flagged as late, but may be revisited up to the number of allowable attempts. However, Xronos HW is not accepted late.

Incomplete

Students who are currently passing a course but are unable to complete the course because of illness or emergency may be granted an incomplete grade of I which will allow the student to complete the course within the first two weeks of the following semester. See the policy on http://www.math.ufl.edu/fac/incompletes.html. If you meet the criteria, you must contact the course coordinator before finals week to be considered for an I. An I only allows you to make up your incomplete work, not redo your work.

Online Technical Issues

For resolving technical issues relating to the online assignments, it is preferred that you do one of the following: Reach out to your instructor or TA with plenty of notice before the assignment deadline (in office hours or send a canvas message) or visit the helpdesk website (https://it.ufl.edu/helpdesk/). Any of us can help you troubleshoot your issues. These issues should not be used as an excuse the night before an assignment is due as you have have advanced access to assignments.

Grading scheme

Online Homework (3 drops): 15%

Lecture Quizzes (3 drops): 15%

Midterm Exam Average (3 mid-term exams): 45%

Final Exam: 25%

Grading Scale

Your final grade will rounded to the nearest hundredth and a letter grade will be given using the following grading scale:

90.00-100 A	87.00-89.99 A-	84.00-86.99 B+	80.00-83.99 B
77.00-79.99 B-	74.00-76.99 C+	67.00-73.99 C	64.00-66.99 C-*
60.00-63.99 D+	57.00-59.99 D	54.00-56.99 D-	0-53.99 E

*__Note__ A grade of C- DOES NOT give Gordon Rule or General Education credit!

For those take the S-U option: 67.00-100 S 0.00-66.99 U

Approval of the S-U option must be obtained from your instructor. The deadline for filing an application with the Registrar and further restrictions on the S-U option are given in the Undergraduate Catalog.

For a complete explanation of current policies for assigning grade points, refer to the UF undergraduate catalog:

https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

NOTE: We will not review disputed points at the end of the semester. All grade concerns must be settled within one week of the return of the graded assignment.

Please refrain from reaching out at the end of the semester to ask for your grade to be rounded up or to inquire about extra assignments or opportunities. There are hard cutoffs and deadlines for all assignments for a reason. Given the number of students in this course, it is not feasible to give out extra work/assignments once the semester has ended.

Extra Credit

Each midterm exam has 105 points on it but is taken out of 100 points. The final exam has 110 points on it but is taken out of 100 points. Because of this, inherent in each exam are bonus points. There are also extra credit discussion boards worth two points each. There is one of these boards for each exam period.

Campus Resources

In addition to attending your discussion section regularly and visiting your discussion leader, lecture, or the course coordinator, during their office hours, the following aids are available.

- The Math Help Center in Little 215 is open for drop-in assistance with homework Monday through Friday from 10:40 to 3:50. It is staffed by mathematics graduate students and undergraduate assistants. Please note that this space is not designed for intense one-on-one tutoring, but rather as a resource for quick questions and explanations. You should not expect the staff to help you if you have not at least begun your homework and have specific questions. Moreover, they absolutely will not assist you with quizzes or any other such work.

- The Teaching Center Math Lab, located in SE Broward Hall, is a tutorial service staffed by trained math and science students to provide help with your calculus questions and homework. Tutors will be glad to provide guidance on specific problems after you have attempted them on your own. You may want to attend different hours to find tutors with whom you feel most comfortable. You can also request free one-on-one tutoring.

- Office hours are a great way to get help. Consider attending your instructor or TA's office hours. If there are multiple TA's in a class, you can go to any TA's office hours. You can find these office hours listed on the canvas home page.

  The teaching center tutors hold reviews on the evenings before each exam. They also provide videos of review and sample test problems. Check the webpage, teachingcenter.ufl.edu, for a map of the location, tutoring hours, and test review dates and locations. Additional practice exams and video tutorials may be found here: https://academicresources.clas.ufl.edu/vsi/. **All students are encouraged to use the teaching center**.

- Office of Academic Support offers free one-on-one and small group tutoring sessions to an UF students. See http://oas.aa.ufl.edu/tutoring.aspx for details.

- Textbooks and solutions manuals are located at reserve desks at Marston Science Library.

- Private Tutors: If after availing yourself of these aids, you feel you need more help, you may obtain a list of qualified tutors for hire at www.math.ufl.edu. Seach "tutors".

- The Counseling Center provides a variety of resources for mental health and well-being to students as well. Go to https://counseling.ufl.edu/

Calculators

Calculators are **NOT** permitted on exams and discussion assignments. Calculators should be used in moderation when working through homework assignments.

Cell Phones

Cell phones must be turned off (not on vibrate) before coming to class. Use (defined as having one physically in your hand) of a cell phone during a test or quiz will be considered contact with another person and will be viewed as a form of academic dishonesty because I cannot be assured in such a circumstance that you have not taken a picture of the test/quiz or sent a text message to someone. As a result, **all infractions will be reported to the Dean of Students Office.** Wait until after you have left the room and are finished with the test/quiz to use it.

Students with Learning Disabilities

Students requesting class and exam accommodations must first register with the Dean of Students Office Disability Resource Center (DRC), www.dso.ufl.edu/drc/. That office will provide a documentation letter via email to the course coordinator. This must be done as early as possible in the semester, **at least one week before the first exam**, so there is adequate time to make proper accommodations. If a student wishes to take their discussion quizzes with additional time, they must contact their instructor to set up appointments at the DRC each week. Similarly, if a student requires additional time on exams, they must schedule this to be taken through the DRC. Extra time cannot be provided otherwise. For online students, once your letter of accommodation has been received by your instructor, they will apply additional time to all applicable assignments in Canvas.

COVID Policy

In response to COVID-19, the following recommendations are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones.

- If you are not vaccinated, get vaccinated. Vaccines are readily available and have been demonstrated to be safe and effective against the COVID-19 virus. Visit one.uf for screening / testing and vaccination opportunities.
- If you are sick, stay home. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 to be evaluated.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work.

Diversity and Inclusion

The Mathematics Department is committed to diversity and inclusion of all students. We acknowledge, respect, and value the diverse nature, background and perspective of students and believe that it furthers academic achievements It is our intent to present materials and activities that are respectful of diversity: race, color, creed, gender, gender identity, sexual orientation, age, religious status, national origin, ethnicity, disability, socioeconomic status, and any other distinguishing qualities.

Academic Honesty Policy

UF students are bound by The Honor Pledge which states "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. See the UF Conduct Code website for more information at https://sccr.dso.ufl.edu/process/student-conduct-code/. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Important Summer 2025 Academic Dates and Deadlines

Classes Begin	Monday, May 12
Drop/Add	May 12 - 13
Withdrawal deadline (full refund)	Tuesday, May 13
Withdrawal deadline (25% refund)	Friday, May 30
Drop deadline (no refund)	Friday, August 1
Classes end	Wednesday, August 8

Holidays (no classes)

Memorial Day	May 26
Juneteenth	June 19
Summer Break	June 23 - 27
Independence Day	July 4

Note: Information in this syllabus is subject to change. Any changes will be clearly announced in class or through e-mail.

Detailed Course Map

This Course Map describes all topics covered in this course and what tasks students complete to achieve the Student Learning Outcomes on a weekly basis.

Unit 1

Week 1 "Lecture 1: Precalculus Review"
1. Define the absolute value function.
2. Solve inequalities.
3. Solve equations involving roots and powers.
4. Identify and solve linear equations.

Week 1 "Lecture 2: Precalculus Review 2"
1. Identify polynomial, rational, root, trigonometric, and exponential functions.
2. Calculate values of the six trigonometric functions at various angles on the unit circle.
3. Solve trigonometric equations.

Week 1 Lecture 3: Precalculus Review 3"
1. Define one-to-one function.
2. Calculate the inverse of a given one-to-one function.
3. Define the domain and range of a function.
4. Find the domain and range of an inverse function.
5. Perform mathematical operations with exponential and logarithmic functions.

Week 1 Precalculus Review 4"
1. Define the composition of functions.
2. Find the domain of composite functions.
3. Investigate inverse functions and relate these to ideas of function composition.
4. Examine the graphs of various functions.

Week 1 "Lecture 5: Limits"
1. Define the meaning of limit of a function.
2. Evaluate the limit using algebraic and graphical techniques.

Week 2 "Lecture 6: Limits 2"
1. Define one-sided limits.
2. Define infinite limits.
3. Calculate values of limits involving absolute value expressions.

Week 2" Lecture 7: Continuity"
1. Define the term continuity.

2. Identify continuous and discontinuous functions.
3. Classify the different types of discontinuities.
4. Define and apply the Intermediate Value Theorem.

Week 2 "Lecture 8: Indeterminate Forms"
1. Identify indeterminate forms resulting from limits.
2. Eliminate indeterminate forms using algebraic techniques.
3. Evaluate limits at infinity algebraically and graphically.
4. Define and identify asymptotes for a given function.

Week 3 "Lecture 9: Derivatives"
1. Define the definition and alternative definition of the derivative.
2. Use the derivative to calculate the slope of the tangent line and velocity of a particle in position.
3. Use both the definition of the derivative and the alternate definition of the derivative to find the derivative of a function at a point.
4. Calculate the equation of a tangent line.
5. Use derivatives to calculate instantaneous rates of change.
6. Use linear approximations to approximate the value of a function.
7. Approximate the value of a function at a given x-value using the tangent line.

Week 3 "Lecture 10: Derivative as a Function"
1. Distinguish different notations for the derivative.
2. Define what it means for a function to be differentiable.
3. Classify situations when a function is not differentiable.

Week 3 "Unit 1 Review and Exam"

Unit 2

Week 4 "Lecture 11: Derivative of Power Functions"
1. Develop basic differentiation rules, including the derivatives of constant functions, power functions, exponential functions, and sums and differences of these functions.
2. Find the derivative of polynomial functions.
3. Find the derivative of power functions such as x^2 and x^3.
4. Find the derivative of exponential functions.

Week 4 "Lecture 12: Product and Quotient Rules"
1. Perform the product and quotient rule to find the derivative of relevant functions.
2. Use the Product Rule to evaluate the derivative of a product of two functions.
3. Use the Quotient Rule to evaluate the derivative of a quotient of two functions.

Week 4 "Lecture 13: Rates of Change"
1. Describe further applications of the derivative as the rate of change.
2. Explain why the derivative of a function can be interpreted as the instantaneous rate of change of the

function.
3. Calculate the instantaneous rate of change of a function.
4. Calculate the velocity and acceleration of an object if given the position function.
5. Determine when an object is at rest and moving up/down or left/right if given the position function.
6. Determine the total vertical or horizontal distance an object travels over a time interval if given the position function.
7. Calculate the marginal cost of producing a good when given the cost function.
8. Find a general formula for calculating the nth derivative of a function.

Week 5 "Lecture 14: Derivatives of Trig. Functions"
1. Develop derivative rules for the six trigonometric functions: $\sin(x)$, $\cos(x)$, $\tan(x)$, $\sec(x)$, $\csc(x)$, and $\cot(x)$.
2. Find the derivative of the six trigonometric functions.
3. Find the derivative of sums, differences, products, and quotients of functions involving the six trigonometric functions.

Week 5 "Lecture 15: Chain Rule"
1. Interpret composite functions in the context of the Chain Rule.
2. Define the Chain Rule for differentiation.
3. Combine the Power Rule and Chain Rule.
4. Apply this rule to find the slope of the tangent line.
5. State the Chain Rule using both functional notation and Leibniz notation.
6. Use the Chain Rule to evaluate the derivative of a composition of functions.
7. Use the Chain Rule more than once to evaluate the derivatives of compositions of functions.

Week 5 "Lecture 16: Implicit Differentiation"
1. Define implicit function.
2. Outline the process for finding the derivatives of an implicit function.
3. Determine the slope of implicit functions using the derivative.

Week 6 "Lecture 17: More Derivative Rules"
1. Redefine the inverse of a function from the first week of this course.
2. Apply a theorem involving the derivative of an inverse function.
3. Define the derivatives of inverse trigonometric functions.
4. Define the derivatives of $\ln(x)$ and $\log(x)$.
5. Combine the chain rule with these new rules.
6. Review basic logarithmic rules from algebra.
7. Use logarithms to simplify the process of calculating derivatives.
8. Find derivatives of functions involving natural logarithms and logarithms with positive base a.
9. Use the properties of logarithms to simplify functions before differentiating.
10. Use logarithmic differentiation to find the derivatives of functions that can be simplified using logarithms.
11. Find derivatives of functions of the form $f(x)^{g(x)}$.

Week 6 "Lecture 18: Related Rates"
1. Define related rates.
2. Outline the process of solving a related rate problem.

Week 6 "Unit 2 Review and Exam"

Unit 3

Week 8 "Lecture 19: Linear Approx. and Differentials"
1. Define the linearization of a function $f(x)$.
2. Use the equation of the tangent line to estimate the value of a more complicated function.
3. Define the differential.
4. Use the differential to approximate the actual change in function value.
5. Find the linear approximation of a function at a point.
6. Use a linear approximation to approximate a function at a point.
7. Calculate differentials.
8. Use differentials to estimate absolute and relative error.
9. Calculate the maximum error in using a differential to approximate Δy.

Week 8 "Lecture 20: Extreme Values/ Critical Points"
1. Define the absolute extrema of a function.
2. Define the Extreme Value Theorem.
3. Define the relative (local) extrema for a function.
4. Define critical numbers.
5. Define Fermat's Theorem.
6. Use critical numbers to locate the extreme values of a function.
7. Find the absolute extrema of a continuous function on a closed interval.

Week 8 "Lecture 21: Mean Value Theorem"
1. Define the Mean Value Theorem and Rolle's Theorem.
2. Apply MVT and Rolle's Theorem to specific examples.
3. Find the value(s) guaranteed by Rolle's Theorem and the Mean Value Theorem.

Week 9 "Lecture 22: First Derivative Test"
1. Relate the first derivative of $f(x)$ to the graph behavior of $f(x)$.
2. Locate intervals where $f(x)$ is increasing or decreasing.
3. Use the first derivative to locate relative extrema.
4. Determine the intervals on which a function is increasing or decreasing.
5. Determine whether a critical point leads to a local maximum, local minimum, or neither.

Week 9 "Lecture 23: Concavity, Second Derivative Test"
1. Define concave up and concave down for a function $f(x)$.
2. Identify how the second derivative relates to the concavity of $f(x)$.
3. Apply the test for concavity using the second derivative.
4. Define inflection point.
5. Find inflection points of a given function.
6. Define the second derivative test.

7. State the Concavity Test and the Second Derivative Test.
8. Determine the intervals on which a function is concave upward or concave downward.
9. Use the Second Derivative Test to determine if a critical point is a local maximum or a local minimum.
10. Sketch the graph of a function by using the first and second derivatives.

Week 9 "Lecture 24: L'Hopital's Rule"
1. Define L'Hôpital's Rule.
2. Classify the seven indeterminate forms.
3. Practice many examples involving indeterminate limits and applying L'Hôpital's Rule.
4. Identify when a limit is an indeterminate form.
5. Use L'Hôpital's Rule to evaluate indeterminate forms of type $\frac{0}{0}$ and $\frac{\infty}{\infty}$.
6. Rewrite indeterminate forms of type 0^0, $\infty - \infty$, ... so that L'Hôpital's Rule can be applied.

Week 10 "Lecture 25: Curve Sketching"
1. Identify important features of graphs such as: domain, intercepts, symmetry, and asymptotes.
2. Reflect on how $f'(x)$ and $f''(x)$ affect the shape of the graph.
3. Synthesize all we have learned so far to sketch a picture of the graph of $f(x)$.

Week 10 "Lecture 26: Applied Optimization"
1. Outline the process of solving an optimization problem.
2. Define objective and constraint function.
3. Utilize the first and second derivative to optimize a given objective function.
4. Explore a multitude of applications involving optimization.
5. Revisit the first derivative test and place it in context to absolute extreme values.

Week 10 "Unit 3 Review and Exam"

Unit 4

Week 11 "Lecture 27: Antiderivatives"
1. Define antiderivative.
2. Define general antiderivative.
3. Practice finding general antiderivatives.
4. Review many past differentiation formulas.
5. Solve initial value problems.
6. Find antiderivatives of functions by reversing differentiation rules.
7. Find a unique antiderivative if given an initial condition.
8. Find a position function if given either a velocity or acceleration function.

Week 11 "Lecture 28: Areas, Riemann Sums"
1. Execute finding the area under any curve.
2. Define the left, midpoint, and right Riemann sums for estimating area under the curve.
3. Practice examples of estimating the area under the curve.

4. Implement summation notation as an aid in Riemann Sum calculations.
5. Develop applications of Riemann sums to different scenarios.
6. Represent the area under a curve as the limit of a Riemann sum.
7. Recognize the relationship between an antiderivative of the speed of an object and the area under the curve of the speed function.

Week 11 "Lecture 29: The Definite Integral"
1. Define the definite integral.
2. Use the notation involved with integrals.
3. Express a summation as a definite integral and vice versa.
4. Define the notation of a signed area.
5. Evaluate the definite integral by interpreting as the signed area under the curve.
6. Evaluate integrals using summation notation.
7. Organize various properties of definite integrals.
8. Use the definition of the definite integral to evaluate the area under a curve.
9. State the properties of the definite integral and use them to evaluate and find bounds for definite integrals.

Week 12 "Lecture 30: The Fundamental Theorem of Calculus"
1. Define parts 1 and 2 of the fundamental theorem of calculus.
2. Combine the chain rule with part 1 of the fundamental theorem of calculus.
3. Practice integration.
4. Solve for the exact area under a curve with $f(x) > 0$ for the entire interval.
5. Relate the fundamental theorem of calculus with antiderivative discussion in L27.
6. Apply properties of the integral.
7. Calculate various integrals using antiderivatives.

Week 12 "Lecture 31: Net Change Theorem"
1. Define the Net Change Theorem.
2. Relate the Net Change Theorem to the fundamental theorem of Calculus.
3. Explore applications of the Net Change Theorem.
4. Contrast total distance traveled and displacement.
5. Use the integral to calculate displacement and total distance traveled.
6. Understand the difference between a definite integral and an indefinite integral.
7. Calculate the net change of a function given its rate of change.

Week 12 "Lecture 32: Integration: Substitution Method"
1. Define the substitution method for integrals.
2. Practice using the substitution method for integration.
3. Determine whether a function is even, odd, or neither.
4. Use the symmetry of a function (even or odd) to evaluate definite integrals.

Week 13 Final Exam Review

Tentative Schedule

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	May 12 L1 - Precalc Review	May 13 L2 - Precalc Review	May 14 L3 - Precalc Review	May 15 L4 - Precalc Review	May 16 L5 - Limits Introduction
2	May 19 L6 - Limits Continued	May 20	May 21 L7 - Continuity	May 22	May 23 L8 - Indeterminate Forms
3	May 26 Holiday	May 27 L9 - The Derivative	May 28 L10 - Derivative as a Function	May 29	May 30 **Exam 1**
4	June 2 L11 - Power and Exponential Rules	June 3	June 4 L12 - Product and Quotient Rule	June 5	June 6 L13 - Rates of Change
5	June 9 L14 - Derivatives of Trigonometric Functions	June 10	June 11 L15 - Chain Rule	June 12	June 13 L16 - Implicit Differentiation
6	June 16 L17 - Logarithmic Differentiation	June 17	June 18 L18 - Related Rates	June 19 Holiday	June 20 **Exam 2**
7	June 23 Summer Break	June 24 Summer Break	June 25 Summer Break	June 26 Summer Break	June 27 Summer Break
8	June 30 L19 - Linear Approximations and Differentials	July 1	July 2 L20 - Extreme Values, Fermat's Theorem, Critical Points	July 3 L21 - Rolle's Theorem and Mean Value Theorem	July 4 Holiday

Week	Monday	Tuesday	Wednesday	Thursday	Friday
9	July 7 L22 - First Derivative Test	July 8	July 9 L23 - Concavity and Second Derivative Test	July 10	July 11 L24 - L'Hopital's Rule
10	July 14 L25 - Curve Sketching	July 15	July 16 L26 - Applied Optimization	July 17	July 18 **Exam 3**
11	July 21 L27 - Antiderivatives	July 22	July 23 L28 - Areas and Riemann Sums	July 24	July 25 L29 - The Definite Integral
12	July 28 L30 - The Fundamental Theorem of Calculus	July 29	July 30 L31 - Net Change	July 31	August 1 L32 - The Substitution Method for Integrals
13	August 4	August 5	August 6	August 7	August 8 **Final Exam**