

MATH 1512: Calculus I

Instructor

Dr. Ariel Ramirez
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 Office: LRC 133

Class Details

Tuesday/Thursday
 Class Time: 3—4:45pm
 Room: VAS 124

Tutoring Hours

T/W/TH 10:00—12:00 pm (LRC)
 Or by Appointment



"Laboratory Still Life 02" - Don Shank

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Course Description

This course covers Limits. Continuity. Derivative: definition, rules, geometric and rate-of-change interpretations, applications to graphing, linearization and optimization. Integral: definition, fundamental theorem of calculus, substitution, applications to areas, volumes, work, average. Meets New Mexico Lower Division General Education Common Core Curriculum Area II: Mathematics (NMCCN 1614). (4 Credit Hours).

Prerequisites: (1230 and 1240) or 1250 or ACT Math \Rightarrow 28 or SAT Math Section \Rightarrow 640 or ACCUPLACER Next-Generation Advanced Algebra and Functions \Rightarrow 284 or Lobo Course Placement Math \Rightarrow 70. Check with your adviser to make sure you meet the requirements.



Get To Know Your Professor

I am Dr. Ariel Ramirez, an Assistant Professor of Mathematics at UNM-Valencia. I grew up in Chicago, Illinois. I enjoy Electronic Dance Music, Classical Music, and bowling. I have a Bachelor's degree in Astronomy from The University of Illinois at Urbana-Champaign, a Master's in Mathematics from the University of Illinois at Chicago, and a Ph.D. in Mathematics Education from Illinois State University. I have taught college-level mathematics at the undergraduate and graduate levels since 2000.

Course Outcomes

This course will investigate differentiation and integration techniques used to solve applied problems. A complete list of the Student Learning Objectives for this course is given at the end of this syllabus.

Course Materials

Textbook:

Calculus, 11th edition, by Larson, R., & Edwards, B. Cengage Publishing.
 ISBN: 9781337879699.

Required: Appropriate WebAssign access code (do not purchase a generic code, in this case the code is book specific). You should be able to access the textbook through REDSHELF. This access will provide you with the e-text and online courseware for 24 months. See <https://canvasinfo.unm.edu/external-apps/redshelf-index.html> or canvas.unm.edu

Technical Requirements: *Computer*

A high-speed Internet connection is highly recommended. Supported browsers include Chrome, Edge, Firefox, Safari, and Internet Explorer. Any computer capable of running a recently updated web browser should be sufficient to access your online course. However, remember that processor speed, amount of RAM, and Internet connection speed can *greatly* affect performance. ***Some programs that use mathematics will not work well on mobile devices such as smartphones or tablets.***

Microsoft Office products are available free for all UNM students (more information on the UNM IT Software Distribution and Downloads page)

Please update your contact information in LoboWeb: **MyUNM**. When you log into MyUNM, Enter LoboWeb. Click on the Personal Information link to ensure your contact information is current. Laptops may be available for checkout for the Fall semester from the **UNM-Valencia Library**. Contact the librarians for more information.

Classroom Policies

Attendance / Participation (10%)

You are expected to be on time to each class, stay the entire class, have the necessary course materials, and participate in the lecture and group activities to receive full credit for attendance each day.

Absences: If you know you will miss a class ahead of time, send me an email indicating the date of the absence.

Arrange before the next class meeting to get notes from a classmate. The student bears full responsibility for the material and information covered in class.

Each student starts with 100 attendance points. Attendance is taken at the **beginning** of class. Eight attendance points are deducted for each unexcused absence; Four attendance points for tardiness.

Online Homework (25%)

Homework is assigned nearly every week based on the course outline. Weekly assignments in WebAssign must be completed no later than the indicated date (usually Friday 5 pm). **Each homework assignment is worth 20 points.** The lowest homework grade will be dropped. You cannot go back to improve your grade after the due date. **DO NOT** consider any grades posted in WebAssign as representing your actual grade (I will periodically update Canvas with grades).

Written Homework (15%)

A separate written homework is to be completed as indicated on the outline. The written homework aims to determine if you understand the concepts correctly by working with application problems. Each homework assignment is worth 20 points. I will not grade illegible homework.

Late homework has a week's grace period and will receive a 20% penalty.



Classroom Policies



Gottfried Wilhelm Leibniz,

(June 21, 1646—November 14, 1716), German philosopher, mathematician, and political adviser, important both as a metaphysician and as a logician and distinguished also for his independent invention of the differential and integral calculus.

In-Class Group Problems (5%)

- During the semester, we will have several in-class problem sets. You will work together in groups.
- Groups will depend on the size of the class.
- These assignments will further develop your conceptual understanding of the topics presented in the course.
- **You must be present and participate to receive any credit.**
- Each group problem set is worth five participation points.

Midterm Exam (20%)

The midterm in class is worth 100 points. If you are ill or an unexpected event happens, and you cannot attend the exam, you have one week to make it up.

Final Exam (25%)

The final exam in class will cover all the topics in the course. It will be based on the exams, quizzes, and homework.

Credit-hour Statement: This is a four-credit-hour course. Class meets for two 105-minute direct instruction sessions for sixteen weeks during the semester. Please plan for at least four hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

Student Resources: If you are struggling in this course, do not be afraid to ask for help!

- Office Hours: See my office hours listed at the beginning of this syllabus.
- Form study groups: You may work together with other members of our class.

Tutoring is available in math, science, writing, and other subjects through the Learning Commons: Learning and STEM Centers and Writing Center. In-person tutoring is in these centers in the LRC (the building that also has the library). Tutoring in Zoom and, for writing, through email is also available.

Tutoring is a fantastic way to use your resources and set yourself up to learn deeply and well in your courses.

To schedule an appointment, please go to [Learning Commons Bookings](#). If you are making an email appointment with the Writing Center, email your draft to tutor@unm.edu after you fill out the form above.

If you have difficulty with the scheduling link above, would like an appointment in a subject not listed at that link, or have a question, email tutor@unm.edu. You'll get answers during business hours, Monday through Friday.

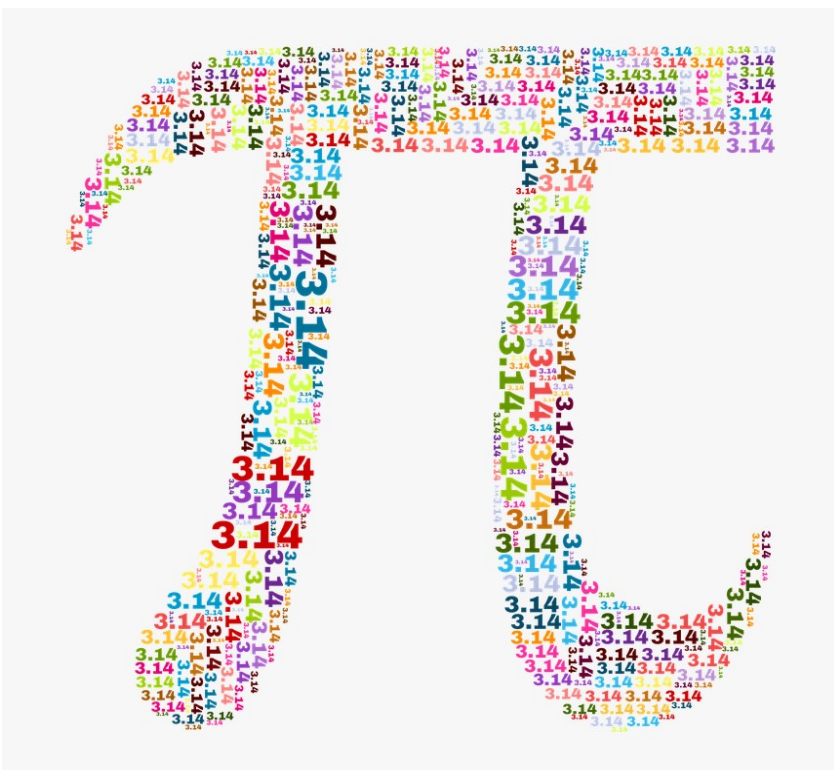
The webpage, with more details about available hours, is here: [Learning Commons: Tutoring Services webpage](#).

[Center for Academic Program Support \(CAPS\)](#). Many students have found that time management workshops can help them meet their goals (consult [\(CAPS\) website](#) under "services").

University Policies

COVID-19 Health and Awareness

UNM is a mask friendly, but not a mask-required, community. To be registered or employed at UNM, Students, faculty, and staff must all meet UNM's [Administrative Mandate on Required COVID-19 vaccination](#). If you are experiencing COVID-19 symptoms, please do not come to class. If you have a positive COVID-19 test, please stay home for five days and isolate yourself from others, per the [Centers for Disease Control \(CDC\) guidelines](#). If you need to stay home, please communicate with me via email (aramirez8@unm.edu) or Canvas course messaging; I can work with you to provide alternatives for course participation and completion. UNM faculty and staff know that these are challenging times. Please let us know if you need support so we can connect you to the right re-



sources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

Support:

[PASOS Resource Center](#) (505) 925-8546, <mailto:pasos@unm.edu>. The Resource Center is an on-campus center that serves as a "one-stop" for all non-academic needs of UNM-Valencia students.

[LoboRESPECT Advocacy Center](#) (505) 277-2911 can help contact faculty and manage challenges that impact your UNM experience.

Accommodations:

UNM is committed to providing courses that are inclusive and accessible for all participants. As your instructor, I aim to facilitate an accessible classroom where students have full access and opportunity. If you are experiencing physical or academic barriers or concerns

related to mental health, physical health, and/or COVID-19, please consult with me after class, via email/phone, or during office/drop-in hours (I am not legally permitted to inquire about the need for accommodations). We can meet your needs in collaboration with the [UNM Valencia Campus community](#) (505) 925-8910 and/or the Accessibility Resource Center (<https://arc.unm.edu/>) at arcsrvs@unm.edu or by phone (505) 277-3506.

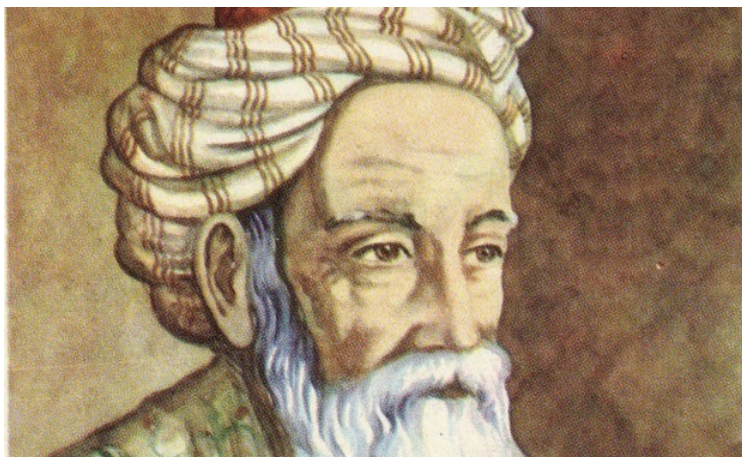
Title IX: Our classroom and university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to you on campus. Please note that because UNM faculty, TAs, and Gas are considered "responsible employees" by the Department of Education, any disclosure of gender discrimination (including sexual harassment, sexual misconduct, and sexual violence) made to a faculty member, TA, or GA must be reported by that faculty member, TA, or GA to the university's Title IX coordinator. For more information on the campus policy regarding sexual misconduct, please see <https://policy.unm.edu/university-policies/2000/2740.html>. **Support:** [LoboRESPECT Advocacy Center](#) and the support services listed on its website, the [Women's Resource Center](#), and the [LGBTQ Resource Center](#) all offer confidential services and reporting.

University Policies (continued)

Land Acknowledgement: Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.

Resource: [Division for Equity and Inclusion](#).

Citizenship and/or Immigration Status: All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM, as an institution, has committed to the success of all our students, including our undocumented community members. The Administration's welcome is found on our website: <http://undocumented.unm.edu/>.



Omar Khayyam 1048-1131

Khayyam was an astronomer, astrologer, physician, philosopher, and mathematician. In 1070, he published *Treatise on Demonstration of Problems of Algebra and Balancing*. In it he showed that a cubic equation can have more than one solution. He also showed how the intersections of conic sections such as parabolas and circles can be utilized to yield geometric solutions of cubic equations.

www.famousscientists.org/omar-khayyam/.

Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

[The UNM Copyright Guide](#) has additional helpful information on this topic. <https://copyright.unm.edu>

Accessibility Statements

[Blackboard's Accessibility statement](#) <https://www.blackboard.com/blackboard-accessibility-commitment>

[Microsoft's Accessibility statement](#) <https://www.microsoft.com/en-us/accessibility/>

Academic Integrity

Having academic integrity is paramount to your success in any class. Plagiarism or cheating is not tolerated. Any instance of this will result in a grade of zero for that assignment.

Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question or for the course.

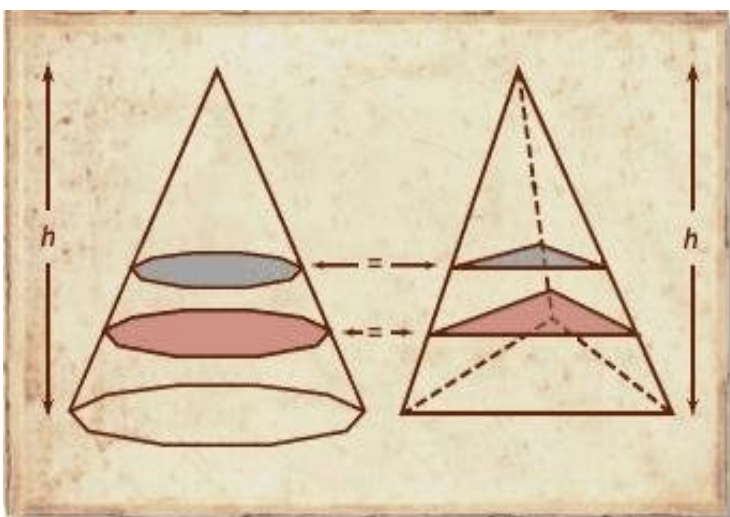
Academic Dishonesty is defined as:

"Academic dishonesty" includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Respectful and Responsible Learning: We all have a shared responsibility for ensuring that learning occurs safely and equitably. UNM has important policies to preserve and protect the academic community, especially policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9).

University Policies (continued)

Respectful and Responsible Learning (continued): These are in the *Student Pathfinder* (<https://pathfinder.unm.edu>) and the *Faculty Handbook* (<https://handbook.unm.edu>). Please ask for help understanding and avoiding plagiarism or academic dishonesty, which can have very serious consequences.



Cavalieri's Principle
Bonaventura Cavalieri, (1598 — 1647) Italian mathematician who made developments in geometry that were precursors to integral calculus. Cavalieri observed that figures (solids) of equal height and in which all corresponding cross sections match in length (area) are of equal area (volume).

Support: [Center for Academic Program Support](#) (CAPS). Many students have found that time management workshops can help them meet their goals (consult CAPS website under "services").

Connecting to Campus and Finding Support: UNM-Valencia has many resources and centers to help you thrive, [including opportunities to get involved](#), [mental health resources](#), [academic support including tutoring](#), [resource centers](#), free food at [Valencia Campus Food Pantry](#), and [jobs on campus](#). Your advisor, staff at the resource centers, and I can help you find the right opportunities.

Instructor Response Time:
 I routinely check the course for postings or emails, Monday (9 am) – Friday (5 pm). You can anticipate a 24 to 36-hour response from me. I will try and respond to all weekend (Friday 5 pm

to Sunday) emails and postings by noon on Monday. Use UNM Canvas or UNM email for communications.

Grading

COURSE AVERAGES:

| | |
|--------------------------------|-------------|
| Attendance/Class Participation | 10% |
| WebAssign Online Homework | 25% |
| Written Homework | 15% |
| In-Class Group Assignments | 5% |
| Midterm Exam | 20% |
| Cumulative Final Exam | 25% |
| Total | 100% |

GRADING SCALE:

Letter Grade Weighted Average

| | | | | | |
|----|----------|---|---------|----|---------|
| A+ | [98,100] | A | [92,98] | A- | [90,92] |
| B+ | [88,90) | B | [82,88) | B- | [80,82) |
| C+ | [78,80) | C | [72,78) | C- | [70,72) |
| D+ | [68,70) | D | [60,68) | | |
| F | [0,60) | | | | |

| <u>Week</u> | Dates | Sections / Topics | Assignments |
|---|---------------------|---|---|
| 1 | 8/22-8/24 T/TH | Introduction Sec. 1.1: Preview of Calculus Sec. 1.2: Finding Limits Graphically and Numerically Sec. 1.3: Evaluating Limits Analytically | |
| 2 | 8/29-8/31 T/TH | Sec. 1.4: Continuity and One-Sided Limits Sec. 1.5: Infinite Limits | WebAssign HW#1 due 9/1 Written HW#1 due 8/31 |
| | 9/1 F 9/4 M | Last day to add a course (5pm) Labor Day (Campus Closed) | |
| 3 | 9/5-9/7 T/TH | Sec. 2.1: Derivative and the Tangent Line Sec. 2.2: Basic Differentiation Rules | WebAssign HW2 due 9/8 Written HW#2 due 9/7 |
| | 9/8 F | Last day to drop a course without a grade / 100% Tuition refund (5pm) | |
| 4 | 9/12-9/14 T/TH | Sec. 2.3: Product/Quotient Rules & Higher-Order Sec. 2.4: The Chain Rule | WebAssign HW3 due 9/15 Written HW#3 due 9/14 |
| 5 | 9/19-9/21 T/TH | Sec. 2.5: Implicit Differentiation Sec. 2.6: Related Rates | WebAssign HW4 due 9/22 Written HW#4 due 9/21 |
| 6 | 9/26-9/28 T/TH | Sec. 3.1: Extrema on an Interval Sec. 3.2: Rolle's/Mean Value Theorem | WebAssign HW5 due 9/29 Written HW#5 due 9/28 |
| 7 | 10/3-10/5 T/TH | Review Exam #1 | |
| 8 | 10/10 T | Sec. 3.3: Increasing/Decreasing Function/1st Derivative Test | WebAssign HW6 due 10/13 |
| 10/12- 10/13 Fall Break | | | |
| 9 | 10/17-10/19 T/TH | Sec. 3.4: Concavity/ 2nd Derivative Test Sec. 3.5: Limits at Infinity | WebAssign HW7 due 10/20 Written HW#6 due 10/19 |
| 10 | 10/24-10/26 T/TH | Sec. 3.7: Optimization Problems Sec. 3.9: Differentials | WebAssign HW8 due 10/27 Written HW#7 due 10/26 |
| 11 | 10/31-11/2 T/TH | Sec. 4.1: Antiderivative & Indefinite Integration Sec. 4.2: Area | WebAssign HW9 due 11/3 Written HW#8 due 11/2 |
| 12 | 11/7-11/9 T/TH | Sec. 4.3: Riemann Sums & Definite Integrals Sec. 4.4: Fundamental Theorem of Calculus | WebAssign HW10 due 11/10 Written HW#9 due 11/9 |
| | 11/10 F | Last day to drop without Dean's Permission (5pm) | |
| 13 | 11/14-11/16 T/TH | Sec. 4.5: Integration by Substitution Sec. 5.4: Exponential Functions/Differentiation & Integration | WebAssign HW11 due 11/17 Written HW#10 due 11/16 |
| 14 | 11/21 T | Sec. 5.6: Indeterminate Forms & L'Hopital's Rule | WebAssign HW12 due 11/25 |
| 15 | 11/28-11/30 T/TH | Sec. 7.1: Area of a Region between Two Curves Sec. 7.2: Volume: Disk Method | WebAssign HW13 due 12/1 Written HW#11 due 11/30 |
| 11/23 - 11/24 Thanksgiving Break | | | |
| 16 | 12/5-12/7 T/TH | Sec. 7.3: Volume: Shell Method Review | WebAssign HW14 due 12/8 Written HW#12 due 12/7 |
| | 12/7 F | Last day to drop with Dean's permission/change grade mode with form (5pm) | |
| 17 | 12/12 T | Final Exam 3-5pm | |

Math 1512: Written Homework Problems

| Homework # | Section, Page, and Problem Number | Due Date |
|------------|--|----------------|
| 1 | Sec. 1.2 page 61: #68a, b Sec. 1.3 page 73: #101 | 8/31 Thursday |
| 2 | Sec. 1.4 page 86: #122a,b Sec. 1.5 page 93: #62a, b | 9/7 Thursday |
| 3 | Sec. 2.1 page 108: #54 Sec. 2.2 page 121: #108 | 9/14 Thursday |
| 4 | Sec. 2.3 page 131: #90a, b Sec. 2.4 page 142: #104a, b | 9/21 Thursday |
| 5 | Sec. 2.5 page 150: #60 Sec. 2.6 page 158: #26 | 9/28 Thursday |
| 6 | Sec. 3.1 page 173: #61 Sec. 3.2 page 179: #53a, b Sec. 3.3 page 189: #79 | 10/19 Thursday |
| 7 | Sec. 3.4 page 198: #68a, b, c Sec. 3.5 page 207: #54, 57b | 10/26 Thursday |
| 8 | Sec. 3.7 page 226: #40 Sec. 3.9 page 241: #36a, b, c | 11/2 Thursday |
| 9 | Sec. 4.1 page 257: #62 Sec. 4.2 page 269: #72a, b, c, d | 11/9 Thursday |
| 10 | Sec. 4.3 page 279: #48a, b, c Sec. 4.4 page 294: #90a, b, c | 11/16 Thursday |
| 11 | Sec. 4.5 page 308: #92a Sec. 5.4 page 351: #136 Sec. 5.6 page 371: #88 | 11/30 Thursday |
| 12 | Sec. 7.1 page 453: #80a, b Sec. 7.2 page 463: #68 | 12/7 Thursday |

Course Student Learning Outcomes

Upon successful completion of the course, students will be able to:

- A. State, motivate, and interpret the definitions of continuity, the derivative, and the definite integral of a function, including an illustrative figure, and apply the definition to test for continuity and differentiability. In all cases, limits are computed using correct and clear notation. Students can interpret the derivative as an instantaneous rate of change and the definite integral as an averaging process.
- B. Use the derivative to graph functions, approximate functions, and solve optimization problems. In all cases, the work, including all necessary algebra, is shown clearly, concisely, in a well-organized fashion. Graphs are neat and well-annotated, clearly indicating limiting behavior. English sentences summarize the main results, and appropriate units are used for all dimensional applications.
- C. Graph, differentiate, optimize, approximate, and integrate functions containing parameters, and functions defined piecewise. Differentiate and approximate functions defined implicitly.
- D. Apply tools from pre-calculus and trigonometry correctly in multi-step problems, such as basic geometric formulas, graphs of basic functions, and algebra to solve equations and inequalities.
- E. State the main theorems of calculus correctly, including all conditions, and give examples of applications. These include the Intermediate Value Theorem, the Mean Value Theorem, the Extreme Value Theorem, and the Fundamental Theorem of Calculus.
- F. Solve simple first and second order differential equations, either initial or boundary value problems, including problems where the derivative is given by a piecewise function, or when the initial value problem is described in words, such as in applications from physics, biology and engineering. Be familiar with the harmonic oscillator and describe period, amplitude, phase-shift of the trigonometric functions that appear.
- G. Compute integrals using the substitution method, including changing the bounds for definite integrals.