MATH 1512: Calculus I

Instructor

Dr. Ariel Ramirez

aramirez8@unm.edu
Office: LRC 133

Class Details

Monday/Wednesday
Class Time: 3—4:45pm
Room: VAS 124
WebAssign Class Key:
unm 8470 6034

Tutoring Hours

**T/Th 1—2:30 pm (LRC)
Or by Appointment**

"Laboratory Still Life 02" - Don Shank

Course Description

This course coves 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 =>28 or SAT Math Section =>640 or ACCUPLACER Next-Generation Advanced Algebra and Functions =>284 or Lobo Course Placement Math =>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. My Bachelor's degree in Astronomy is from The University of Illinois at Urbana-Champaign, my Master's degree in Mathematics is from the University of Illinois at Chicago, and my 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

In this course, we 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

Contents

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 make sure your contact information is up to date.
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 <u>on time</u> to each class and stay the <u>entire</u> class, have the necessary course materials on hand, and participate in the lecture and/or group activities to receive full credit for attendance each day.

Absences: If you know ahead of time you will miss a class, 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 is deducted for each unexcused absence; Four attendance point for tardiness.

Homework (25%)
Homework is assigned nearly every week based on the course outline. Weekly assignments in WebAssign must be completed not later than the indicated date. **Each homework assignment is worth 25 points**. The lowest homework grade will be dropped. A 10% penalty may be incurred if your homework is late. You will not be able to go back to improve your grade after the due date.

Quiz (10%)
We will have 7 quizzes in class for 10 points each. The lowest grade on a quiz will be dropped. Each quiz will have a few problems from the online homework. The quizzes will resemble the exam and final exam, so you should use them to study.

Classroom Policies

In-Class Group Assignments & Projects (10%)
- During the semester, we will have several in-class assignments. You will work in groups.
- Groups will be between two and three students.
- These assignments will further develop your conceptual understanding of the topics presented in the course.
- **You must be present to participate and receive any credit**.
- Each in-class assignment is worth 25 points. Each group member receives the same grade.
- A couple of small projects will be worth 25 points each and will require application of the material learned during the course.

Midterm Exam (20%)
The midterm is worth 100 points. If you are ill or an unexpected event happens, and you cannot make it to the exam, you have one week to make it up.

Final Exam (25%)
The final exam will cover all the topics in the course. It will be based on the exams, quizzes, and homework.

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.

EXPECTATIONS: Students are expected to conduct themselves in a polite, courteous, professional and collegial manner. **Cell phones must be <u>set on silent</u> and <u>be out of sight</u> during class. No food or drink is allowed in the computer labs.**

Credit-hour Statement: This is a four-credit-hour course. Class meets for two 105-minute direct instruction sessions for sixteen weeks during the Fall 2022 semester. Please plan for a minimum of six 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.
- Free Tutoring: The Math Center at Valencia campus has free tutoring and open labs. UNM Valencia Learning Commons (tutoring).
- Student Services: There are various services provided in our Student Services Department. See below about equal access. Also, we have a testing center, advising, and career placement available: Valencia Student Services
- 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 that you need support so we can connect you to the right resources. Please be aware that UNM will publish information on websites and email about any changes to our public health status and community response.

Support:

Student Health and Counseling (SHAC) at (505) 277-3136. If you have active respiratory symptoms (e.g., fever, cough, sore throat, etc.) AND need testing for COVID-19; OR If you recently tested positive and may need oral treatment, call SHAC.

LoboRESPECT Advocacy Center (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

Accommodations:

UNM is committed to providing courses that are inclusive and accessible for all participants. As your instructor, it is my objective to facilitate an accessible classroom setting in which 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.
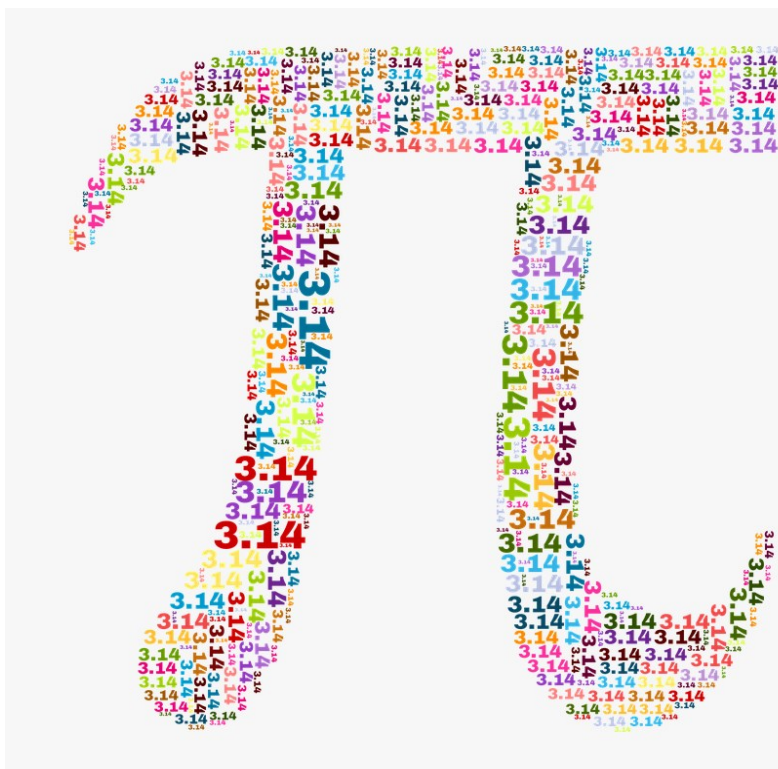
University Policies (continued)

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 members of our undocumented community. The Administration's welcome is found on our website: http://undocumented.unm.edu/.
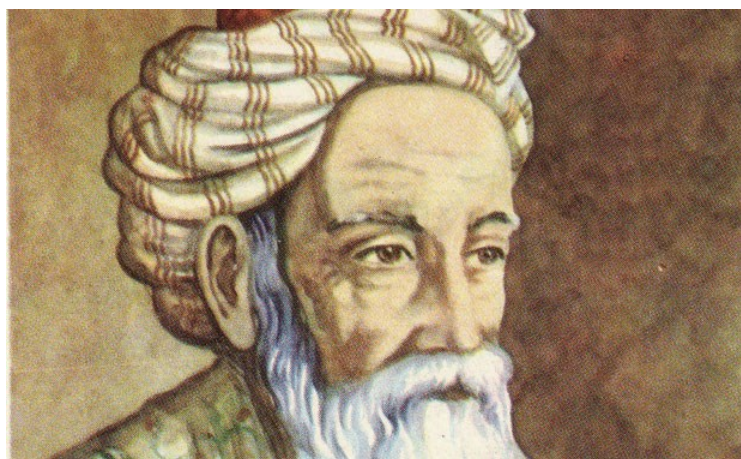
Omar Khayyam 1048-1131
Khayyam was an astronomer, astrologer, physician, philosopher, and mathematician. In 1070, he published *Treatise on Demonstration of Problems of Algebra and Balancing*. In it he showed that a cubic equation can have more than one solution. He also showed how the intersections 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 course work 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 C09).

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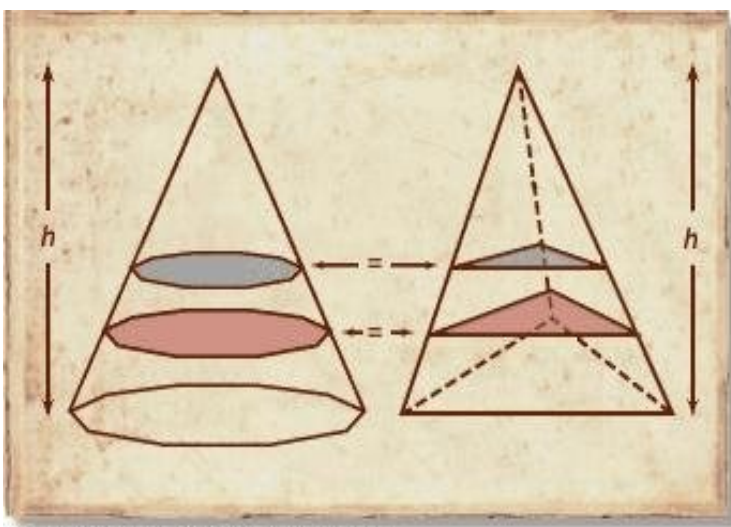
Support: Center for Academic Program Support (CAPS). Many students have found that time management workshops can help them meet their goals (consult CAPS website under "services").

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 for you.

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).

Grading

COURSE AVERAGES:

Attendance/Class Participation	10%
WebAssign Online Homework	25%
Quizzes	10%
In-Class Group Assignments & Projects	10%
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)				

Week	Dates	Sections / Topics	Assignments
1	8/22-8/24 M/W	Introduction, Quick Review Sec. 1.1: Preview of Calculus Sec. 1.2: Finding Limits Graphically and Numerically	
2	8/29-8/31 M/W	Sec. 1.3: Evaluating Limits Analytically Sec. 1.4: Continuity and One-Sided Limits	MML homework 1 due Quiz #1
	9/2 F	**Last day to add a course (5pm)**	
3	9/5-9/7 M/W	**Labor Day 9/5 (No Class)** Sec. 1.5: Infinite Limits	MML homework 2 due
	9/9 F	**Last day to drop a course without a grade (5pm)**	
4	9/12-9/14 M/W	Sec. 2.1: Derivative and the Tangent Line Sec. 2.2: Basic Differentiation Rules	MML homework 3 due Quiz #2
5	9/19-9/21 M/W	Sec. 2.3: Product/Quotient Rules & Higher-Order Sec. 2.4: The Chain Rule	MML homework 4 due
6	9/26-9/28 M/W	Sec. 2.5: Implicit Differentiation Sec. 2.6: Related Rates	MML homework 5 due Quiz #3
7	10/3-10/5 M/W	Sec. 3.1: Extrema on an Interval Sec. 3.2: Rolle's/Mean Value Theorem	MML homework 6 due Quiz #4
8	10/10-10/12 M/W	*Review* Exam #1	MML homework 7 due
		10/13 – 10/14 Fall Break	
9	10/17-10/19 M/W	Sec. 3.3: Increasing/Decreasing Function/1st Derivative Test Sec. 3.4: Concavity/ 2nd Derivative Test	
10	10/24-10/26 M/W	Sec. 3.5: Limits at Infinity Sec. 3.7: Optimization Problems	MML homework 8 due Quiz #5
11	10/31-11/2 M/W	Sec. 3.9: Differentials Sec. 4.1: Antiderivative & Indefinite Integration	MML homework 9 due
12	11/7-11/9 M/W	Sec. 4.2: Area Sec. 4.3: Riemann Sums & Definite Integrals	MML homework 10 due Quiz #6
	11/11 F	**Last day to drop without Dean's Permission (5pm)**	
13	11/14-11/16 M/W	Sec. 4.4: Fundamental Theorem of Calculus Sec. 4.5: Integration by Substitution	MML homework 11 due
14	11/21-11/23 M/W	Sec. 5.4: Exponential Functions/Differentiation & Integration Sec. 5.6: Indeterminate Forms & L'Hopital's Rule	MML homework 12 due Quiz #7
15	11/28-11/30 M/W	Sec. 7.1: Area of a Region between Two Curves Sec. 7.2: Volume: Disk Method	MML homework 13 due
		11/24 – 11/25 Thanksgiving Break	
16	12/5-12/7 M/W	Sec. 7.3: Volume: Shell Method *Review*	MML homework 14 due
	12/9 F	**Last day to drop with Dean's permission/change grade mode with form (5pm)**	
17	12/12	**Final Exam Week**	

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. Student 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 method of substitution, including changing the bounds in the case of definite integrals.