

# MATH 1430: Applications of Calculus I

## Instructor

**Dr. Ariel Ramirez**

aramirez8@unm.edu

Office: LRC 133

## Class Details

Monday/Wednesday

Class Time: 3—4:15pm

Room: VAS 141

MyMathLab Course ID:

**ramirez37154**

## Tutoring Hours

T/Th 1—2:30 pm (LRC)

Or by Appointment



"Laboratory Still Life O2" - Don Shank

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## Course Description

An algebraic and graphical study of derivatives and integrals, with an emphasis on applications to business, social science, economics and the sciences. . Meets New Mexico General Education Curriculum Area II: Mathematics and Statistics. (3 Credit Hours).

**Prerequisites:** 1220 or 1240 or 1250 or ACT Math  $\Rightarrow$  26 or SAT Math Section  $\Rightarrow$  620 or ACCUPLACER Next-Generation Advanced Algebra and Functions =249-283. 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 with Applications, 12th edition, by Lial, M. L., Greenwell R. N., & Ritchey N. P. Pearson Publishing.

**Required:** Appropriate MyMathLab 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. See <https://canvasinfo.unm.edu/external-apps/redshelf-index.html> or [canvas.unm.edu](https://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 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 on time to each class and stay the entire 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.

### Online Homework (25%)

Homework is assigned nearly every week based on the course outline. Weekly assignments in MyMath-Lab (MML) must be completed not later than the indicated date. **Each homework assignment is worth 25 points.** The lowest homework grade will be dropped. You will not be able to go back to improve your grade after the due date.

### Written Homework (10%)

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 25 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 Assignments (10%)

During the semester, we will have several in-class assignments. These assignments will further develop your conceptual understanding of the topics presented in the course. You will work in groups between two and three students. **You must be present to participate and receive any credit.** Each in-class assignment is worth 25 points. Each group member gets the same grade.

### Midterm Exam (20%)

The midterm 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 will cover all the topics in the course. It will be based on the exams, and homework.

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

**Credit-hour Statement:** This is a three-credit-hour course. Class meets for two 75-minute direct instruction sessions for sixteen weeks during the semester. Please plan for a minimum of 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 to you 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](mailto: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](mailto: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](mailto: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.

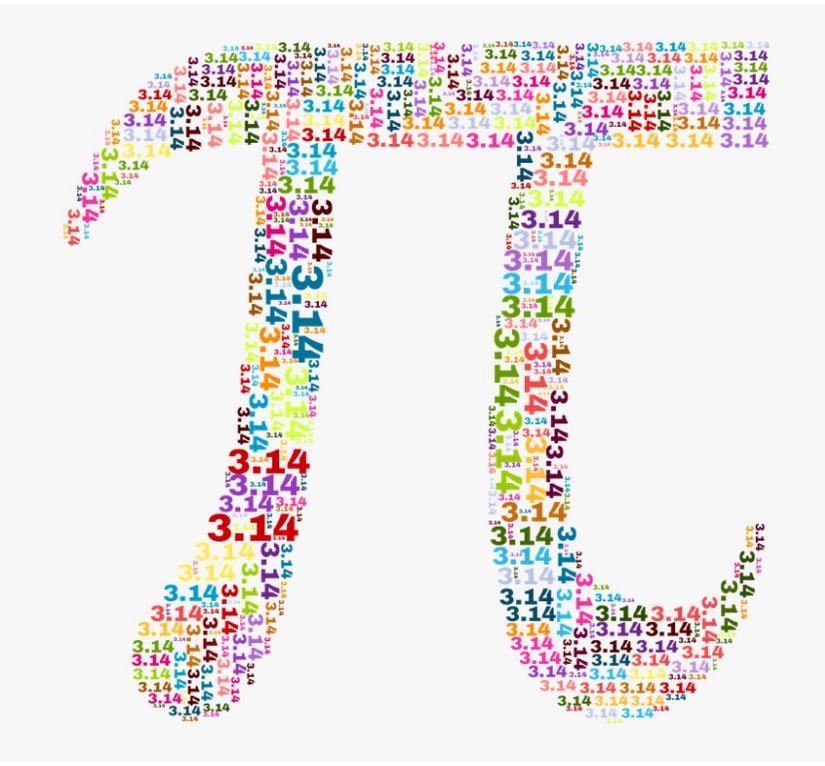
Support:

**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 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](mailto:arcsrvs@unm.edu) or by phone (505) 277-3506.



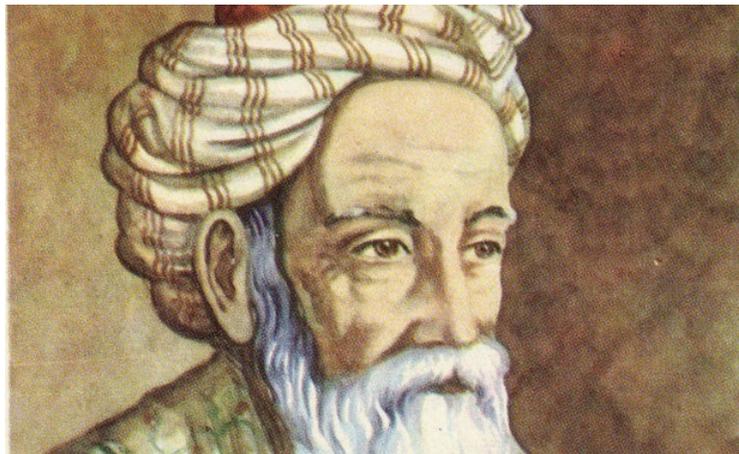
**Title IX:** Our classroom and university should always be spaces of mutual respect, kindness, and support, without fear of discrimination, harassment, or violence. Should you ever need assistance or have concerns about incidents that violate this principle, please access the resources available to 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/](http://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.*

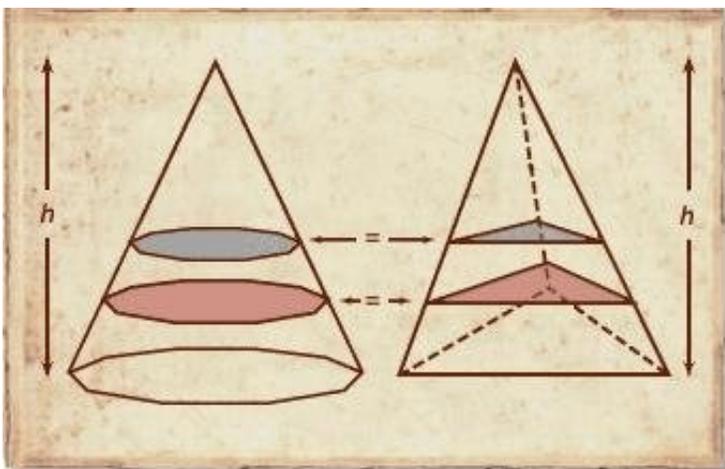
Academic Dishonesty is defined as:

*"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 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.



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### 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

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.

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

**Credit-hour Statement:** This is a three-credit-hour course. Class meets for two 75-minute direct instruction sessions for sixteen weeks during the semester. Please plan for a minimum of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

## Grading

### COURSE AVERAGES:

Attendance/Class Participation	10%
MyMathLab Online Homework	25%
Written Homework	10%
In-Class Group Assignments	10%
Midterm Exam	20%
Cumulative Final Exam	25%
<b>Total</b>	<b>100%</b>

### 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	1/18 W	Introduction Sec. 1.1: Slopes and Equations of Lines Sec. 2.1: Properties of Functions	
2	1/23—1/25 M/W	Sec. 2.4: Exponential Functions Sec. 2.5: Logarithmic Functions Sec. 3.1: Limits	MML homework 1 due
	1/27 F	<b>Last day to add a course (5pm)</b>	
3	1/30—2/1 M/W	Sec. 3.1: Limits Sec. 3.2: Continuity	MML homework 2 due Written HW #1 due In-Class Assignment #1
	2/3 F	<b>Last day to drop a course without a grade (5pm)</b>	
4	2/6—2/8 M/W	Sec. 3.3: Rates of Change Sec. 3.4: Definition of the Derivative	MML homework 3 due Written HW #2 due
5	2/13—2/15 M/W	Sec. 4.1: Techniques for Finding Derivatives Sec. 4.2: Derivatives of Products and Quotients	MML homework 4 due Written HW #3 due In-Class Assignment #2
6	2/20—2/22 M/W	Sec. 4.3: Chain Rules Sec. 4.4: Derivatives of Exponential Functions	MML homework 5 due Written HW #4 due
7	2/27—3/1 M/W	Sec. 4.5: Derivatives of Logarithmic Functions Sec. 5.1: Increasing and Decreasing Functions	MML homework 6 due Written HW #5 due In-Class Assignment #3
8	3/6—3/8 M/W	<b>Review Exam #1</b>	MML homework 7 due
<b>3/13 - 3/19 Spring Break</b>			
9	3/20—3/22 M/W	Sec. 5.2: Relative Extrema Sec. 5.3: Higher Derivatives, Concavity, and the Second Derivative Test	
10	3/27—3/29 M/W	Sec. 6.1: Absolute Extrema Sec. 6.2: Applications of Extrema	MML homework 8 due Written HW #6 due
11	4/3—4/5 M/W	Sec. 6.4: Implicit Differentiation Sec. 6.5: Relates Rates	MML homework 9 due Written HW #7 due In-Class Assignment #4
12	4/10—4/12 M/W	Sec. 6.6: Differentials: Linear Approximations (Quick) Sec. 7.1: Antiderivatives	MML homework 10 due Written HW #8 due
	4/14 F	<b>Last day to drop without Student Success Permission (5pm)</b>	
13	4/17—4/19 M/W	Sec. 7.2: Substitution Sec. 7.3: Area and the Definite Integral	MML homework 11 due Written HW #9 due In-Class Assignment #5
14	4/24—4/26 M/W	Sec. 7.4: The Fundamental Theorem of Calculus	MML homework 12 due Written HW #10 due
15	5/1—5/3 M/W	Sec. 7.5: The Area Between Two Curves <b>Review</b>	MML homework 13 due
	5/5 F	<b>Last day to drop with Dean's permission/change grade mode with form (5pm)</b>	
16		<b>Final Exam Wednesday 5/10 3-5pm</b>	

## 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. State the main theorems of calculus correctly, including all conditions, and give examples of applications. These include the Intermediate Value Theorem, the Extreme Value Theorem, and the Fundamental Theorem of Calculus.
- E. Compute integrals using the method of substitution, including changing the bounds in the case of definite integrals.