

Lamar University

Department of Mathematics

MATH 2413 Calculus & Analytic Geometry I
Fall 2017 Syllabus
11:30-12:25 MWF
11:10-12:05 TTh

Instructor: Dr. Valentin Andreev, Professor of Mathematics

Office: Lucas 202

Email: valentin.andreev@lamar.edu

Phone: 409-880-8693

Office Hours: MWF 11:00-11:30

TTh 12:05-1:05

Other times are available by appointment

I do not tutor the day of the exam

Prerequisites: Grade of C or better in MATH 2312 or its equivalent, or Math Readiness
Score of 800

Text: Calculus: Early Transcendental Functions by Larson and Edwards, 6e edition, WebAssign

Catalog Description: Functions, limits, derivatives of algebraic, trigonometric, exponential and logarithmic functions, curve sketching, related rates, maximum and minimum problems, definite and indefinite integrals with applications.

MATH 2413 Learning Outcomes: Upon completion of the course, students will:

1. Develop solutions for tangent and area problems using the concepts of limits, derivatives, and integrals.
2. Draw graphs of algebraic and transcendental functions considering limits, continuity, and differentiability at a point.
3. Determine whether a function is continuous and/or differentiable at a point using limits.
4. Use differentiation rules to differentiate algebraic and transcendental functions.
5. Identify appropriate calculus concepts and techniques to provide mathematical models of real-world situations and determine solutions to applied problems.
6. Evaluate definite integrals using the Fundamental Theorem of Calculus.
7. Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus.
8. Compute the limit of a function;
9. Interpret various definitions of a derivative including rate of change, slope of tangent line, and velocity;
10. Find first order and higher order derivatives using the quotient rule, product rule, chain rule, and implicit differentiation;
11. Find tangent lines, related rates, linear approximations, and solve optimization problems;

12. Identify intervals of increase, decrease, and concavity for a function;
13. Apply the Mean Value Theorem and L'Hospital's Rule;
14. Compute definite and indefinite integrals, using various methods including the substitution rule;
15. Find volumes of solids of revolutions using rings and shells.

Core Curriculum Outcomes: Upon completion of this course, the student will demonstrate his or her abilities to think critically, communicate quantitative information, and apply mathematical concepts:

1. **Critical Thinking:** Develop a logical, consistent plan to solve a problem, recognize consequences of the solution, and articulate a reason for choosing solution method.
2. **Communication Skills:** Use and present quantitative information in connection with an argument or problem solution and explicate it in an effective format.
3. **Empirical and Quantitative:** Construct and present a detailed problem statement with evidence of relevant contextual factors and possible approaches for solving the problem, then implement a solution and review the results.

Lectures/Discussions: Please see the attached list of topics.

In order to make the class experience of students as productive as possible, a typical class will follow the following pattern. We will discuss the new material in class and then I will assign an open notes individual assignment. This will be followed by group work without the use of notes. The students who present the solutions of individual assignments on the board will receive extra credit. There will be a computer graded home-work. My goal is for the students to master most of the material in class and complete their assigned work on a regular basis without cramming prior to an exam.

The best way to prepare for exams and to minimize exam anxiety, in my opinion, is to study every day. First, you should pay attention in class, ask questions, respond to questions, be active, keep notes. Then go over everything after the class, make sure you understand everything and that you remember the new material. If you have questions, write them down and ask as soon as possible, either me or the tutors in the tutoring lab. Do the homework.

Finally, take a few problems that were not assigned but that are on the same topics as the homework, close the book and all notes (which will be the way you will take the graded assignments), and try to solve the problems. If you succeed, you are ready, if not, then try to figure out why, or ask for help. Furthermore, study with other students in the class.

Grading Policies Students are expected to be in class on time and to stay for the entire class period. Students are warned that excessive absences are not conducive to achievement. There will be four exams and a comprehensive final exam. Exams will be announced in class one week in advance. Exam 1 will be on Review, Exam 2 will be on Limits and Differentiation, Exam 3 will be on Applications of Differentiation, Exam 4 will be on Integration and its Applications, and the final exam will be comprehensive. The home-works will be 10% of your grade, in class group work and quizzes – 25%, Exam 1 - 9%, Exam 2 – 12%, Exam 3 – 12%, Exam 4 – 12%, Final – 20%. Final grades will be provided on Banner and will be based on the following scale: A-90%, B-80%, C-70%, D-60%, F-below 60%.

There will no make-ups for quizzes, group works, and home-works. Makeup for tests will be allowed only if one has a university acceptable excuse, but it must be scheduled as soon as possible

and completed within ten days of the original testing date. If a student takes a bathroom break during a test, the student will be required to hand in the completed work and will be assigned new problems on the uncompleted part.

Attendance Policy: While roll will not be taken every class period, it is important for you to understand the value of class attendance and accept the personal responsibility involved. You are expected to be in class on time and stay for the entire period. Your final grade will be negatively affected if you miss class. As mentioned in the section above, late work will not be accepted and there will be no make-up quizzes.

Final Exam: Wednesday, May 2, 8:00-10:30.

While I have made a sincere effort to ensure that this syllabus is correct, changes may be required. I will announce any substantive changes **during a regularly scheduled class [in a Blackboard announcement]**. If you find an error or omission, please advise me at once so that the other members of the class may be advised.

Topics:

Review

Functions

Basic Classes of Functions

Trigonometric Functions

Inverse Functions

Exponential and Logarithmic Functions

Limits

The Limit of a Function

The Limit Laws

Continuity

The Precise Definition of a Limit*

Derivatives

Defining the Derivative

The Derivative as a Function

Differentiation Rules

Derivatives as Rates of Change

Derivatives of Trigonometric Functions

The Chain Rule

Derivatives of Inverse Functions

Implicit Differentiation

Derivatives of Exponential and Logarithmic Functions

Applications of Derivatives

Related Rates

Linear Approximations and Differentials

Maxima and Minima

The Mean Value Theorem
Derivatives and the Shape of a Graph
Limits at Infinity and Asymptotes
Applied Optimization Problems
L'Hôpital's Rule
Newton's Method*
Antiderivatives

Integration

Approximating Areas
The Definite Integral
The Fundamental Theorem of Calculus
Integration Formulas and the Net Change Theorem
Substitution
Integrals Involving Exponential and Logarithmic Functions
Integrals Resulting in Inverse Trigonometric Functions

Applications of Integration

Areas between Curves
Determining Volumes by Slicing
Volumes of Revolution: Cylindrical Shells
Arc Length of a Curve and Surface Area
Physical Applications*
Moments and Centers of Mass*
Integrals, Exponential Functions, and Logarithms
Exponential Growth and Decay
Calculus of the Hyperbolic Functions*

Lamar University expressly prohibits intimidation and harassment of students, faculty, staff, or applicants. <http://students.lamar.edu/academic-support/code-of-conduct.html>

Drop Policy: Please make note of the three dates indicated in this drop policy. Any drop will be your responsibility; I will not drop a student from the course.

January 31, 2018: Last day for full refund on dropped (not withdrawn) courses

February 19, 2018: Last day to drop or withdraw without academic penalty

April 4, 2018: Last day to drop or withdraw with academic penalty

Academic Integrity: Students are expected to maintain complete honesty and integrity in their academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Students are specifically warned against all forms of cheating and plagiarism. The *Lamar University Student Handbook* clearly reads: "Any student found guilty of academic dishonesty in any phase of academic work will be subjected to disciplinary action. Punishable offenses include, but are not limited to, cheating on an examination or academic work which is to be submitted, plagiarism, collusion, and the abuse of source materials." One

aspect of the *Handbook's* definition of cheating includes "purchasing or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm." Plagiarism is defined as "the appropriation and the unacknowledged incorporation of another's work or ideas into one's own and submitted for credit." Faculty members in the College of arts and Sciences investigate all cases of suspected plagiarism. Any student who is found cheating in this course will receive a course grade of F. <http://students.lamar.edu/student-handbook.html>

Accommodations through the Disability Resource Center: Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room 105. Office staff collaborate with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at [409-880-8347](tel:409-880-8347) or drc@lamar.edu to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations. If you are registered with DRC and have a current letter requesting reasonable accommodations, we encourage you to contact your instructor early in the semester to review how the accommodations will be applied in the course.
<http://www.lamar.edu/disability-resource-center/>

Incomplete Grades: The grade of "I" may be given when any requirement of the course, including the final examination, is not completed. Arrangements to complete deficiencies in a course should be made with the instructor prior to the end of the semester or term. Incomplete work must be finished during the next long semester or the Records Office will change the "I" to the grade of "F." While the extension may be granted by the instructor with the approval of his/her Department Chair and Academic Dean, once the "I" is changed to an "F" it cannot be changed back to an "I." In this case, either a "change of grade" procedure must be initiated or the course must then be repeated if credit is desired. The instructor may record the grade of "F" for a student who is absent from the final examinations and is not passing the course.

Campus Closure: In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage for instructions about continuing courses remotely. <http://lamar.edu>

Emergency Procedures: Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at:
<http://www.lamar.edu/about-lu/administration/risk-management/index.html>

Following are procedures for the first two:

Severe Weather:

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter:

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.

- **AVOID-** If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY-** Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND-** Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Course Evaluations: You will have an opportunity to evaluate all aspects of this course in a formal process to be completed online near the end of the term. You will receive an email reminder through your LU account.

Math 2413- Calculus and Analytical Geometry
 Calculus Early Transcendental Functions
 (Larson Edwards) 6th Edition

Sec. Topic Page Problems

Preparation for Calculus

1.5 Inverse Functions **37** 2, 7, 10, 26, 31, 38, 45, 54, 74, 79, 100, 117, 124

1.6 Exponential & Log. Functions **48** 4, 13, 24, 31, 35, 36, 44, 47, 48, 50, 64, 88, 89, 93, 98, 101, 120

Limits and Their Properties

2.1 Limits and Their Properties **61** 1, 3, 6, 9

2.2 Finding Limits **68** 5, 7, 19, 20, 28, 31, 37, 41, 42, 45

2.3 Evaluating Limits **79** 13, 17, 21, 23, 29, 31, 33, 38, 43, 45, 48, 50, 56, 59, 65, 67, 69, 76, 77,

91, 92, 113, 114

2.4 Continuity & One-Sided Limits **90** 8, 11, 14, 17, 22, 27, 34, 35, 56, 70, 73, 86, 87, 93, 96, 107, 108, 119

2.5 Infinite Limits **103** 4, 8, 20, 27, 38, 45, 46, 49, 52, 54, 55, 72, 73

Differentiation

3.1 Derivative & Tangent Line Problem **116** 2, 10, 19, 24, 34, 40, 42, 47, 50, 57, 62, 64, 76, 79, 84, 85, 88

3.2 Differentiation Rules & Rates of Change **126** 41, 44, 45, 48, 51, 54, 55, 57, 60, 61, 66, 69, 82, 85, 102, 121

3.3 Product & Quotient Rules **139** 5, 11, 26, 34, 39, 42, 47, 86, 90, 99, 102, 105, 107, 110, 119, 120, 127

and Higher-Order Derivatives

3.4 The Chain Rule **150** 4, 8, 26, 33, 49, 52, 55, 70, 79, 102, 111, 118, 121, 142, 153

3.5 Implicit Differentiation **165** 16, 21, 23, 38, 59, 67, 70, 73, 80, 81

3.6 Derivatives of Inverse Functions **174** 9, 20, 22, 25, 30, 33, 39, 44, 53, 60

3.7 Related Rates **181** 1, 3, 6, 8, 9, 11, 14, 17, 22, 25, 28, 33

Applications of Differentiation

4.1 Extrema on an Interval **202** 11, 13, 14, 16, 17, 18, 24, 27, 31, 33, 38, 39, 43, 75, 77, 78

4.2 Rolle's Theorem and the Mean Value Theorem **210** 11, 12, 14, 15, 16, 19, 45, 46, 47, 48, 51, 53, 76, 85, 87, 88

4.3 Increasing and Decreasing **217** 11, 13, 17, 22, 28, 33, 39, 48, 54, 59, 64, 65, 82, 83, 113, 117

Functions & the 1st Derivative Test

4.4 Concavity & 2nd Derivative Test **227** 8, 10, 13, 17, 23, 28, 31, 47, 50, 53, 56, 58, 64

4.5 Limits at Infinity **242** 13, 16, 18, 19, 22, 24, 27, 30, 31, 37, 38, 49, 65, 68

8.7 Indeterminate Forms and L'Hopital's Rules **564** 12, 13, 16, 17, 20, 21, 24, 30, 35, 40, 44, 45, 47, 83, 84

L'Hopital's Rules

4.6 Summary of Curve Sketching **253** 2, 4, 9, 15, 18, 21, 28, 32, 37, 42, 55, 58, 63, 81, 82

4.7 Optimization Problems **262** 5, 6, 13, 16, 18, 22, 24, 25, 28, 33, 34, 40, 42, 49

4.8 Differentials **267** 4, 5, 8, 9, 13, 16, 20, 23, 31, 34, 36, 40, 41

Integration

5.1 Antiderivatives & Indefinite Integration **287** 9, 11, 18, 19, 23, 26, 30, 33, 35, 38, 43, 54, 66

5.2 Area **299** 8, 9, 18, 21, 29, 32, 46, 50, 53, 57, 62, 74, 75

5.3 Riemann Sums and Definite Integrals **309** 4, 7, 12, 24, 27, 31, 38, 39, 42, 43, 47, 57, 58, 70, 73

5.4 Fundamental Function of Calculus **324** 5, 10, 13, 18, 19, 26, 27, 32, 37, 40, 45, 48, 51, 58, 59, 86, 107, 108

5.5 Integration by Substitution **337** 1-6, 13, 14, 23, 24, 27, 28, 39, 40

5.7 Natural Logarithmic Function: Integration **354** 1, 2, 13, 14, 21, 24, 27-30, 37, 38, 41, 42, 55, 56

5.8 Inverse Trigonometric Function: Integration **362** 1, 2, 7, 12, 13, 14, 17-20, 25, 26, 35, 36, 39, 40, 43, 44

Applications of Integration

7.1 Area of a Region Between Two Curves **442** 1-8, 17-20, 23, 24, 31, 32, 35, 36, 47, 48

7.2 Volume: The Disk Method **453** 1-6, 11, 12, 15, 16, 23, 24, 31, 32, 35, 36, 47, 48

7.3 Volume: The Shell Method **462** 1-4, 9, 10, 15, 16, 19, 20, 23, 24

7.5* Work **483** 1, 2, 5, 6, 13, 14, 21, 22

7.6* Moments, Centers of Mass, and Centroids **494** 1-4, 7, 8, 13, 14, 27-30, 45-48

7.7* Fluid Pressure and Fluid Force **501** 1, 2, 5-10, 13, 14, 23, 2

* If time permits