

MAT 191: Calculus I

Course Number: MAT 191

Course Title: Calculus I

Credits: 3:3

Prerequisites/Corequisites: An acceptable score on the mathematics placement test or a grade of at least C in MAT 151 or MAT 190.

For Whom Planned: This course is the first of a four semester Calculus sequence, primarily for STEM (science, technology, engineering, and math) students. Students must earn a grade of C or better in this course to satisfy the prerequisite for MAT 292 (Calculus II).

Instructor Information:

Instructor: Dr. Talia Fernós (t_fernos@uncg.edu)

Office Hours: Tuesdays and Thursdays: 10:45am–11:30am; 3:15pm–4:00pm; by appointment in Petty 143

Bulletin Description: Limits and introductory differential calculus of the algebraic and transcendental functions of one variable.

Student Learning Outcomes: MAT 191 satisfies the Mathematics (GMT) requirement of the General Education Program. It is open to and appropriate for all undergraduate students, regardless of major. The General Education learning goals attached to the GMT marker are as follows:

- LG1 Foundational Skills: Think critically, communicate effectively, and develop fundamental skills in quantitative and information literacies.
- LG2 The Physical and Natural World: Understand fundamental principles of mathematics and statistics, and recognize their relevance in the world.

At the successful completion of this course, the student will be able to:

- SLO1 Reason in mathematical systems beyond data manipulation. (LG1, LG2)
- SLO2 Formulate and use mathematical models to solve real-world problems. (LG1, LG2)
- SLO3 Communicate mathematical solutions clearly and effectively. (LG1)

Course Objectives:

- (1) Define limit of a function, continuous functions, derivative of a function.
- (2) Give examples of continuous and differentiable functions, increasing and decreasing functions, concave up and concave down functions.
- (3) Compute limits and derivatives of algebraic and transcendental functions.
- (4) Construct a mathematical model for an optimization problem, solve the model, and interpret the result in the context of the original problem.
- (5) Compare and contrast continuous and discontinuous functions, differentiable and non-differentiable functions;
- (6) Combine different methods to analyze a function to determine its monotonicity and concavity properties and to draw its graph;
- (7) Support and justify statements with rigorous mathematical arguments.

Teaching Methods and Assignments for Achieving Learning Outcomes: Abstract reasoning (SLO1) and clear, effective communication (SLO3) are a part of every lesson and homework in this course. The student, through regular and frequent attention to the lessons and homework questions, will make progress on each of these learning objectives. The formulation and use of mathematical models in real-world problems (SLO2) are integrated in the application of the fundamental techniques covered in the course. Homework questions are designed to reinforce these mathematics learning objectives.

There will be no online activities in this course.

Summary Presentations: With the exception of exam days, every class will begin with a 5-7 minute review of the previous lecture performed by one or two students. The schedule for these reviews will be assigned by alphabetical order. Each reviewer or team of reviewers is expected to prepare a brief written outline to accompany the presentation. The instructor will make this available to the rest of the class through blackboard.

Homework: Homework problems from the book will be assigned and posted in blackboard. You will neatly rewrite your solutions and hand them in for evaluation. Each problem must be written (paraphrasing is OK). Homework that is not clean and clear will not be counted.

Quizzes: There will be almost daily in-class quizzes. They will be based on the material covered recently in class and will frequently be based on homework assignments.

Midterm Exams: There will be three midterm exams and each count toward your final grade.

Final exam: The comprehensive final exam will be Saturday, December 6th, 3:30–6:30 p.m. (This is almost two weeks after our last day of class. This means you will be rusty unless you study throughout this period.)

Evaluation and Grading: The primary student products are the tests and final exam. Due to the nature of the course, each test will address all of the SLOs. Specifically, SLO1 will be present in most of the questions. Several questions on each test will be designed to address SLO2 and SLO3. Since the final exam is cumulative, all of the SLOs will be addressed there. The student will demonstrate achievement of learning objectives through satisfactory completion of graded assignments and tests. The questions on graded assignments and tests are designed to evaluate each of the three learning objectives, and in this way the grade reflects the attainment of the objectives.

The following weight distribution is going to be used to determine your final grades. *The lowest homework score and lowest quiz score will be dropped. The class summary presentation score can replace the second lowest quiz score if that is to the student's benefit.

| | |
|-------------------------------|-----|
| Homework* | 5% |
| Quizzes | 20% |
| Midterm Exams (3 at 15% each) | 45% |
| Final Exam | 30% |

Letter grades are assigned on a 10 point scale.

| | | | | |
|-------------|------------|------------|------------|----------|
| A+ : 97–100 | B+ : 87–89 | C+ : 77–79 | D+ : 67–69 | |
| A : 93–96 | B : 83–86 | C : 73–76 | D : 63–66 | F : 0–59 |
| A– : 90–92 | B– : 80–82 | C– : 70–72 | D– : 60–62 | |

Required Texts/Readings/References:

Laura Taalman and Peter Kohn, *Calculus*, 1st ed., Macmillan Education, 2014.

Topical Outline/Calendar: We will cover all of Chapter 1 Limits, Chapter 2 Derivatives, and Chapter 3 Applications of the Derivative 3 of Taalman and Kohn's *Calculus*, with the exception of Section 1.3.

| | | |
|---------|-----|---|
| Week 1 | 1.1 | An Intuitive Introduction to Limits |
| | 1.2 | Formal Definition of Limit |
| Week 2 | 1.4 | Continuity and Its Consequences |
| Week 3 | 1.5 | Limit Rules and Calculating Basic Limits |
| Week 4 | | Review and Exam 1 |
| Week 5 | 2.1 | An Intuitive Introduction to Derivatives |
| | 2.2 | Formal Definition of the Derivative |
| Week 6 | 2.3 | Rules for Calculating Basic Derivatives |
| Week 7 | 2.4 | The Chain Rule and Implicit Differentiation |
| | 2.5 | Derivatives of Exponential and Logarithmic Functions |
| Week 8 | 2.6 | Derivatives of Trigonometric and Hyperbolic Functions |
| Week 9 | | Review and Exam 2 |
| Week 10 | 3.1 | The Mean Value Theorem |
| | 3.2 | The First Derivative and Curve Sketching |
| Week 11 | 3.3 | The Second Derivative and Curve Sketching |
| Week 12 | 3.4 | Optimization |
| | 3.5 | Related Rates |
| Week 13 | | Review and Exam 3 |
| Week 14 | 1.6 | Infinite Limits and Indeterminate Forms |
| | 3.6 | L'Hôpital's Rule |
| Week 15 | | Review |

Academic Integrity Policy: You are expected to abide by the UNCG Academic Integrity Policy at all times, and any cases of academic dishonesty will not be tolerated. Each student is required to sign the Academic Integrity Policy on all major work submitted for the course.

I have abided by the UNCG Academic Integrity Policy on this assignment.

Signature _____ Date _____

More information can be found at

<http://sa.uncg.edu/handbook/academic-integrity-policy/>.

Attendance Policy: Regular and punctual attendance is expected. You are responsible for any missed work and material. Two consecutive absences or four total absences during the semester may result in you being dropped from the course. Absences will be counted as follows: failure to take a quiz, an exam, or be present to receive an exam that is returned.

Final Examination: The comprehensive final exam will be Saturday, December 6th, 3:30–6:30 p.m.

Additional Information:

Calculator Policy: No calculators will be allowed to be used during any in-class quiz, midterm, or the final exam. You are therefore strongly recommended to not use calculators at home.

Add/drop dates and holidays affecting this class:

- (1) The last day to adjust your schedule with absolutely no penalty is Friday, August 22nd.
- (2) Withdrawing from this course between August 23rd and October 10 will use 3 out of the 16 hour withdrawal limit and will be indicated on a transcript with a grade of WX.
- (3) Dropping this course after October 10 or in excess of the 16 hour limit will result in a grade of WF, which is equivalent to a grade of F for your GPA.
- (4) Labor Day holiday is September 1, Fall Break is October 11–14, and Thanksgiving holiday is November 26–30.

Students with Disabilities: You are responsible for contacting the OARS in 215 EUC (334-5440, <http://ods.uncg.edu>) and for filling out the necessary forms if you wish to have special accommodations. Without these forms the services provided by the OARS will not be available. OARS cannot schedule or reschedule tests without consent from the instructor.

Copyright Policy: Selling or purchasing notes from classes for commercial gain is a violation of the UNCG Copyright Policy. Any student who sells notes taken in class for commercial gain, or who purchases notes taken by another student for commercial gain, is in violation of this policy and, by extension, is committing a violation of the Student Code of Conduct.

<http://sa.uncg.edu/handbook/student-code-of-conduct/>

Free Tutoring: The Department of Mathematics and Statistics provides free walk-in tutoring in the Curry 210 beginning August 25. For the details, see

<http://www.uncg.edu/math/mathhelpcenter>

Student Success Center: Find more academic support at the Student Success Center.

<http://success.uncg.edu/>

Special Support Services: Tutoring may be available from Special Support Services.

<http://success.uncg.edu/sss/tutoring.php>

MAT 191: Explanation for GEC GMT Category Designation

MAT 191 satisfies the Mathematics (GMT) requirement of the General Education Program. It is open to and appropriate for all undergraduate students, regardless of major. The General Education learning goals attached to the GMT marker are as follows:

- LG1 Foundational Skills: Think critically, communicate effectively, and develop fundamental skills in quantitative and information literacies.
- LG2 The Physical and Natural World: Understand fundamental principles of mathematics and statistics, and recognize their relevance in the world.

At the successful completion of this course, the student will be able to:

- SLO1 Reason in mathematical systems beyond data manipulation. (LG1, LG2)
- SLO2 Formulate and use mathematical models to solve real-world problems. (LG1, LG2)
- SLO3 Communicate mathematical solutions clearly and effectively. (LG1)

Abstract reasoning (SLO1) and clear, effective communication (SLO3) are a part of every lesson and homework in this course. The student, through regular and frequent attention to the lessons and homework questions, will make progress on each of these learning objectives. The formulation and use of mathematical models in real-world problems (SLO2) are integrated in the application of the fundamental techniques covered in the course. Homework questions are designed to reinforce these mathematics learning objectives.

The primary student products are the tests and final exam. Due to the nature of the course, each test will address all of the SLOs. Specifically, SLO1 will be present in most of the questions. Several questions on each test will be designed to address SLO2 and SLO3. Since the final exam is cumulative, all of the SLOs will be addressed there. The student will demonstrate achievement of learning objectives through satisfactory completion of graded assignments and tests. The questions on graded assignments and tests are designed to evaluate each of the three learning objectives, and in this way the grade reflects the attainment of the objectives.