# Calculus I & Analytic Geometry I (MTH245)
# Fall 2020

**Class Time and Location:** TR 2:00pm – 4:10 pm S 245

**Instructor**: Damian Maxwell- BSc, The University of the West Indies, Mona Jamaica. MSC, Indiana State University, USA.
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Office Hours: MW 9:25 – 10:55, 3:00 – 4:30
TR 8:50 – 10:50, 12:25 – 1:55
F 10:00 – 12:00 by appointment

**Prerequisites:** Grades of C or better in MTH203 (College Algebra) and MTH213 (Plane Trigonometry).

**Resources**: Text: James Stewart. *Calculus: Early Transcendentials.* 8th ed. Cengage Learning, 2016. ISBN 978-1-285-74155-0

**Required Materials:**
TI- 84 Graphing Calculator, 3-ring notebook, college rule 3-hole paper, graph paper or graph stamp, cardboard folder, mechanical pencils with extra erasers, small pack colored pencils, pens, straight edge.

**Program Outcomes:** The knowledge and critical thinking skills acquired in the general education component enable students to analyze problems, to arrive at intelligent conclusions, and to make reasoned choices in their professional and personal lives.

- Use computational mathematics, algebraic operations, and their practical applications to solve problems which they encounter at home and the workplace.
- Possess basic technological skills to identify, locate, and process information.

**Rationale:** An objective of post-secondary education is to provide a core of knowledge that is shared with most educated people. By studying and developing a deeper understanding of mathematical computations, students can better analyze, problem solve, and prepare critical thinking strategies for real world scenarios. Technological skills with the graphing calculator are necessary for future math courses.

By studying and developing an ability to apply the mathematical principles of the first course in calculus, MTH245 Calculus I, the student will be prepared to continue in the study of the calculus sequence and to compete academically upon transfer to a four-year institution.

**Course Description**:

This course is designed primarily to serve students majoring in mathematics, engineering, physics, chemistry, and various other fields of science. Course content includes a study of functions, limits and continuity, differentiation of algebraic functions and their applications, indefinite integrals, and definite integrals and their applications. (ACTS: MTH2405)

**Course Objectives:** Upon successful completion of MTH 245 Calculus I and Analytic Geometry, the student should be able to:

1. Demonstrate understanding of functions and their graphs, limits, continuity, derivatives, indefinite and definite integrals and their applications.
2. Work with functions represented in a variety of ways—graphically, numerically, analytically, and verbally—and understand the connections among these representations.
3. Use critical thinking to formulate decisions and problem solving based on reasoning and analysis.
4. Communicate mathematics and explain solutions to problems both verbally and in written sentences.
5. Use graphing calculators to help solve problems, experiment, interpret results, and support conclusions.

**Expected Student Learning Outcomes:**

The student will understand and be able to apply the concepts involved with limits, derivatives, and integrals. Topics required are:

- Functions, including sketching, slopes, minimum, maximum, relative extrema, inflection points, asymptotes, and other analysis
- Limits
- Continuity
- Differentiation
- Implicit differentiation
- Exponential, trigonometric, and logarithmic functions
- Exponential growth and decay
- Course includes application of above topics, such as:
    - Slope and rates of change
    - Maximum and minimum values and optimum solutions to problems
- Antiderivatives
- Definite and indefinite integration, including the Fundamental Theorem of Calculus
- Area between curves

**COVID-19 Protocols:** For your protection, and the protection of others, please adhere to the following COVID-19 protocols until further notice.

**Face Mask Policy:** As per the Executive Order from the governor of Arkansas, all students are required to wear a proper face covering that completely covers the nose and mouth while on campus and in class. Masks with holes or masks that do not completely cover nose and mouth are not acceptable. Any student that does not have a proper mask will leave class and be referred to the Vice Chancellor for Student Affairs for possible disciplinary action.

**Food and Drink:** Food and drinks, including water are not allowed in the classroom at any time. This eliminates the need to remove masks and potentially expose others.

**Attendance:** Daily attendance is mandatory, either in-class or through Zoom. Students are expected to adhere to the flex schedule outlined by the instructor regarding the days students are to appear in-class and those days in which students are to attend via Zoom. In the event a student is quarantined, the students will automatically shift to an all-Zoom attendance format for the 14-day period. Students are to notify their instructors of any quarantine orders, and a doctor's note is required. In the event the instructor is quarantined, the entire class will shift to an all-Zoom/online format for the 14-day period. Students will be notified accordingly. Any potential absence is to be shared with the instructor.

**Technology Concerns:** Students with access concerns are expected to communicate with their instructors. Additionally, students can access the wi-fi from the South parking lot near the Ouachita Center. Students with access issues are encouraged to access course Zoom sessions from the parking lot, if needed. Students would be expected to drive to campus under normal classroom conditions. While it is not ideal, it does ensure reliable access and regular course participation. Students may use personal cell phones/devices to attend Zoom sessions. However, students have the option to check out campus computers from the library (Johnson Learning Commons).

**Social Distancing:** Students are to follow the social distancing guidelines as outlined by the Arkansas Department of Health (ADE) and the Centers for Disease Control (CDC). Additionally, UARM staff have clearly marked hallways, arranged classroom furniture, and removed keyboards from workstations to adhere to such guidelines. Students are asked not to assemble in the hallway before class. Please come to class when your class is schedule to start. When leaving the classroom, students will be asked to exit in an orderly manner to allow 6 feet between each person.

**Seating arrangements:** Students are not to sit at workstations where keyboards have been removed. Furthermore, due to contact-tracing regulations required by the ADE and CDC, students are to sit in the **same** seat/location **each** time they come to class.

**Cleaning procedures:** Students are expected to assist in keeping the classroom clean. Students are to clean their workstations each day upon entry and before leaving.

Disinfecting wipes will be provided. Students are expected to wear gloves when using computers and keyboards, as these objects are more difficult to clean without damaging them. Gloves will be provided. To prevent cross-contamination, students are to remove and dispose of gloves upon leaving the classroom.

**Course attendance post-Thanksgiving Break:** Students will not return to campus after Thanksgiving Break. We do not wish to impose any travel restrictions on students during the break. Because we must adhere to the Academic Calendar and cannot adequately quarantine, all remaining coursework will be completed online, via Zoom, etc. Your instructor will provide you with more details as Thanksgiving Break approaches. *It is important that students understand, however, that the semester is NOT over at Thanksgiving. The course does not end until early December.* Students are expected to complete class assignments and maintain virtual attendance until the end of the semester. Lastly, the Final Exam will be administered in an online format.

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**Proposed Course Outline: Calculus I**

| Start Date | Week | Lesson | Topic |
|---|---|---|---|
| 8/25 | 1 | 2.1 | Tangent and Velocity Problems |
| | | 2.2 | The Limit of a Function |
| | | 2.3 | Calculating Limits Using Limit Laws |
| 9/1 | 2 | 2.4 | Precise Definition of a Limit |
| | | 2.5 | Continuity |
| | | 2.6 | Limits at Infinity; Horizontal Asymptotes |
| 9/8 | 3 | 2.7 | Derivatives and Rates of Change |
| | | 2.8 | The Derivative as a Function |
| 9/15 | 4 | 3.1 | Derivatives of Polynomials and Exponential Functions |
| | | 3.2 | The Product and Quotient Rules |
| | | 3.3 | Derivatives of Trigonometric Functions |
| 9/22 | 5 | 3.4 | The Chain Rule |
| | | 3.5 | Implicit Differentiation |
| | | 3.6 | Derivatives of Logarithmic & Exponential Functions |
| 9/29 | 6 | | Test 1 Review |
| | | | **Test 1** |
| | | 3.7 | Rates of Change in Natural and Social Sciences |
| | | 3.8 | Exponential Growth and Decay |
| 10/6 | 7 | 3.9 | Related Rates |
| | | 3.10 | Linear Approximations and Differentials |
| | | 3.11 | Hyperbolic Functions (Just Introduction) |
| 10/13 | 8 | 4.1 | Maximum and Minimum Values |
| | | 4.2 | The Mean Value Theorem |
| 10/20 | 9 | 4.3 | How Derivatives Affect the Shape of a Graph |
| | | 4.4 | Indeterminate Forms and L'Hospital's Rule |
| | | 4.5 | Summary of Curve Sketching |
| 10/27 | 10 | 4.6 | Graphing with Calculus and Calculators |

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|---|---|---|---|
| | | 4.7 | Optimization Problems |
| | | 4.8 | Newton's Method |
| | | | |
| | | | **Test 2** |
| 11/3 | 11 | 4.9 | Antiderivatives/Integration |
| | | 5.1 | Areas and Distances |
| 11/10 | 12 | 5.2 | The Definite Integral |
| | | 5.3 | The Fundamental Theorem of Calculus |
| 11/17 | 13 | 5.4 | Indefinite Integrals and Net Change |
| | | 5.5 | Substitution Rule |
| | | | Review Chapter 5 Practice Test |
| 11/24 | 14 | | **Test 3** |
| 12/1 | 15 | | Study Week/reviews |

**Important Dates:**

| | | |
|---|---|---|
| August 25 | M | Classes begin |
| September 7 | M | Labor Day holiday (no classes, campus closed) |
| October 5-9 | M-F | Priority Registration for Spring |
| October 12 | M | Mid-semester/first 8-week classes final grades due |
| November 25-27 | W-F | Thanksgiving holidays begin (no classes, offices open W) |
| December 4 | F | Classes end/Last day to drop a class with a W |
| December 7-10 | M-R | Final exams (16th week) |
| December 11 | F | Grades due |

**Course Conduct:** The class will be taught using a combination of lecture, group interaction, question and answer approach, and independent study. New topics will be demonstrated using the board, overhead document projector, and TI 84+ Smartview computer program for support of graphing calculator use. Students are strongly encouraged to discuss concepts and examples as opportunities are presented during instructor presentation. It is the student's responsibility to inform the instructor when a concept is confusing or otherwise unclear.

**Course Requirements / Evaluation (Grading):**

**Tests are 30% of your final grade. Three tests are scheduled.**
**Class Attendance & Participation 10%**
**Homework Assignments (Biweekly) 25%**
**Research & Presentations 15%**
**Final Exam 20%**

**The final exam is comprehensive and will include problems from the chapters we have covered in class.**

**90 – 100 = A** **80 – 89 = B** **70 – 70 = C** **60 – 69 = D** **0 – 59 = F**

**Supplies Needed for daily work:** TI-83/84 Calculator supplied by UA Rich Mountain as needed, 3-ring notebook, college rule 3 hole paper, graph paper, cardboard folder, mechanical pencils with extra erasers, pens, yellow highlighter, small pack colored pencils, small ruler or straight edge.

**Criteria for Credit:** Homework must be neat and complete. Each problem assigned has three parts: 1) the original problem with figures drawn where necessary. 2) all steps or an explanation of how to arrive at the correct answer, and 3) the final answer. ***Answers alone are not acceptable***. Use pencils and /or blue or black ink pens and straight edge papers. Write the lesson topic at the top of the first page. Label each page with your name and lesson number in the top right-hand corner. Work in two columns if possible. Highlight final answers with a yellow highlighter. Leave a blank line between problems. All graphs are to be accurately sketched on graph paper with all parts properly labeled and all work for the problem shown on the same page as the graph. Graphs much be drawn with a pencil unless otherwise instructed. For immediate feedback, you may check your answers for most assigned problems in the back of the book. *You will not receive credit for any problems not meeting the criteria for credit described above.*

**Computer and On-Campus Resources:** Computer labs with printers are available in several places on campus including the Johnson Learning Commons. UA Rich Mountain offers students assistance with quality tutors available in the Student Support Services (SSS) and Learning Enrichment and Counseling Center (LEAC) in the Johnson Learning Commons. You may access www.tutor.com/uarichmountain nights and weekends when SSS is not available.

**Attendance / Make-up Policy**: No make-up exams will be given. If you miss an exam, the missing grade will be replaced by the final exam score at the end of the course. Deliberately missing an exam is not advised due to the comprehensive nature of the final exam and the possibility of missing a future exam. The student is responsible for instruction missed during class by studying the material in the book, seeking help from the teacher and/or student support services, and by getting class notes from the teacher or another student.

**Cell Phones:** The use of cell phones in the classroom is prohibited. Turn cell phone off or set on vibrate and store it out of sight during class time. Cell phones will be taken up on test days.

**Academic Dishonesty**: Any suspicion of academic dishonesty will result in no credit for the paper in question.

**Disability Policy:** It is the policy of UA Rich Mountain to accommodate students with disabilities, pursuant to state and federal law. Any student with a disability who needs accommodations should contact the Vice Chancellor for Student Affairs Office, 394-7622, ext. 1460.

**Arkansas Clean Air Act**: In compliance with the Arkansas Clean Air Act, UA Rich Mountain is a smoke and tobacco free facility. Students and guests are to refrain from the use of all tobacco products while on campus.

**Student Misconduct**: Students committing misconduct are subject to disciplinary sanction(s) and/or restrictions. Misconduct or prohibited behavior includes, but is not limited to endangerment, harassment, disruption, sexual misconduct, illegal drugs and/or alcohol, fire or safety issues, gambling, property violations, computer violations or other violations as listed in the UA Rich Mountain catalog.

**UA Rich Mountain Mission**: UA Rich Mountain provides transformative education to all learners. *"under review."*

**UA Rich Mountain Credit Hour Calculator:** For every course credit hour, you should expect to spend at least three clock hours per week of concentrated attention on course-related work, including but not limited to time attending class, as well as out-of-class time spent completing homework, seeking help from instructor or tutors, preparing for upcoming quizzes/tests/exam, reviewing material, problem solving, and organizing your notebook. For a four hour course, a typical student should expect to spend at least twelve hours per week dedicated to this course. This includes the time spent in class.

**Campus Security:** UA Rich Mountain strives to provide a safe learning environment; therefore, students who know of any security risk are to contact a college official. For more information follow this link and look under the title Health and Safety: http://www.uarichmountain.edu/at-a-glance/disclosures

**Credit Hour Requirement Calculator**

**Course Information**

| | | |
|---|---|---|
| Department, Course Number | Mathematics | |
| Course Title | Calculus | |
| Credit Hours | 4 | |
| Mode of Delivery | Traditional | |
| Weeks in Part of Term | 15 | |
| Level of Reading Material | | |
| Reading Level of Students | Above Average Student (1) | 1 |
| Average Pages per Hour | 13 | |

*Enter either week or term, not both*

| Contact Hours | | Hours/Week | Hours/Term | Total Hours |
|---|---|---|---|---|
| Lecture/Recitation | | | 60 | 60 |
| | **Pages Asg'd** | **Hours/Week** | **Hours/Term** | |
| **Syllabus Items** | | | | |
| Weekly Homework Assignments | | 5 | | 75 |
| Prepare for Chapter Tests | | | 12 | 12 |
| Study Assigned examples | 80 | | | 6.2 |
| | | | | 0 |
| | | | | 0 |
| **Total Hours** | | | | 153.2 |
| **Required Hours** | | | | 150 |
| **Difference** | | | | Ok + 3.2 |