

MA 299

CALCULUS I With Mathematica

Fall 2022

Instructor

Lee A. Redmond

Class Meetings Location/Time:

MWF: 11:00 - 11:50am

Office :

136

Phone:

662-254 -3399

E-mail Address:

lredmond@mvsu.edu

CRB Office Hours:

MWF: 10:00 - 11:00 am ; 1:00 -2:00 pm

TR: 2:30 pm - 4:00 pm

M: 2:00 pm - 3:00 pm

Virtual Office Hours:

MWF: 10:00 - 11:00 am

COURSE DESCRIPTION

MA 299. CALCULUS I with Mathematica. Functions, limits, differentiation, integration of algebraic functions with uses of Mathematica software notebooks for visualization of concepts. Prerequisite: MA 111/MA 150 or ACT sub-test of 20 in mathematics. 3

COURSE CONTENT

Text

Lawson, R., Hostetler, R., and Edwards, B. Calculus with Analytic Geometry 11th ed. Houghton Mifflin Company.

MAJOR AREAS OF STUDY

***** Topics and dates are subject to change.**

I. Preparation for Calculus - Optional

Week 1: Aug. 22 - 26, 2022

- A. Equations of a line
- B. Graphing Equations by point-plotting

Week 2: August 28 - Sept. 22, 2022

- C. Functions
- D. Graphing Functions
- E. Trigonometry

Week 3: September 5 - 9, 2022

- F. *Mathematica* Basics
- G. Lab Activity
- H. Test

II. Limits and their properties

Week 4: Sept. 12 - 16, 2022

- A. δ - ϵ definition of a limit

- B. Finding limits numerically and graphically
- C. Evaluating limits analytically

Week 5: Sept 19 - 23, 2022

- D. One-sided limits
Lab Activity
- E. Continuous Functions

Week 6: Sept 26 - Sept. 30, 2022

- F. Intermediate Value Theorem
- G. Infinite Limits
- H. Lab Activity

III. Differentiation

Week 7: October 3 - 7, 2022

- A. Finding the slope and derivative by the limit process
- B. Basic Rules for Differentiation and Rates of Change
- C. Higher Order Derivatives

Week 8: October 10 - 14, 2022

- D. Chain Rule
- E. Implicit differentiation

Week 9: October 17 - 21, 2022

- F. Review of Derivatives
- G. Lab Activities
- H. Derivative Test

IV. Application of Derivatives

Week 10: October 24 - 28, 2022

- A. Relative Extrema and Critical Numbers
- B. Rolle's Theorem
- C. Mean-Value Theorems

Week 11: October 31 - Nov 4, 2022

- D. Monotonicity and the First Derivative Test
- E. Graph Sketching

Week 12: Nov 7 - 11, 2022

- F. Concavity and the Second Derivative Test
- G. Graph Sketching
Lab Activity

Week 13: Nov 14 - 18, 2022

- H. Limits at Infinity
- I. Differentials

Week 14: Nov 28 - Dec 2, 2022

- V. Integration (This topic may be delayed until Calculus II)
 - A. Antiderivatives and Indefinite Integration
 - B. Basic Properties of the Definite Integral
 - C. Fundamental Theorem of Calculus

COURSE OBJECTIVES

Upon completion of this course students will be able to:

- (1) Find and discover limits using different methods.
- (2) Employ estimation techniques, numerical computations, and graphs to analyze the behavior of functions.
- (3) Apply the notion of limits to continuity, rates, derivatives, and other topics in Calculus.
- (4) Use modeling to solve problems in various disciplines.
- (5) Use **Mathematica** as a problem-solving tool.
- (6) Demonstrate knowledge of Differentiation.

PRESENTATION METHODS (METHODS OF INSTRUCTION)

The methods used to accomplish the goals and objectives of this course include a combination of classroom and zoom lectures, demonstrations, class discussions and group activities that require student participation with the instructor and with other students.

MAJOR STUDENT ACTIVITIES

- (1) Students are expected to be in class everyday and attend each virtual session when applicable. They should read intensively from the textbook and spend a considerable amount of time solving problems to help understand the concepts covered in chapters 1 through 4. **Every student must have the textbook and must bring it to class** each meeting.
- (2) Students are expected to pass written examinations based on lectures, labs and assignments. All tests must be taken. For any student who could not take the test, a **make-up test** should be taken before the next scheduled class meeting unless prior preparations have been made with the instructor. Failure to make up a test results in a grade of **zero**.
- (3) Scheduled and random quizzes may be given. **Random quizzes cannot be made up.**
- (4) Students are strongly encouraged to participate in all class (virtual) activities and assignments with both the instructor and other students. Students may earn extra points toward their daily average through class participation (Solving, presenting, and discussing problems) and attending tutoring/work sessions.
- (5) All homework assignments must be completed and submitted on time at the beginning of class or as a **pdf** in canvas. **Incomplete or late** work will not be accepted unless prior preparations have been made with the instructor. An excused absence does not excuse students for any assignments that was submitted on that day.

- (6) A notebook (folder or binder) should be maintained which contains lecture notes and all homework and practice exercises properly labeled. Students can expect interval notebook checks.

EVALUATION AND GRADING PROCEDURES

Averages from following categories will be used to determine the final grade.

| | |
|---|-----|
| written examinations..... | 50% |
| and extended class assignments/projects | |
| final exam | 15% |
| random quizzes and homework | 35% |

| | | |
|-----------------|-------------------|--------------|
| Grading Scales: | <u>Percentage</u> | <u>GRADE</u> |
| | 90-100 | A |
| | 80-89 | B |
| | 70-79 | C |
| | 60-69 | D |
| | Below 60 | F |

Grades in Canvas will only denote your homework/daily average. It will not represent your final grade in the class.

Attendance Policy

It is necessary for students to attend every class meeting or each virtual session. Any student who misses more than the allowed number of absences will be subject to a decrease in their final grade. It is the student’s responsibility to check with the instructor and other students before the next class meeting to find out what happened on days when he/she was out of class. Being excused **does not** mean you are not responsible for any assignments submitted that day. Those assignments must be submitted before the next class meeting unless other arrangements have been made with the instructor.

ADA/STUDENTS WITH SPECIAL NEEDS

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability (medical, physical, psychiatric, learning, vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with Disabilities (SSD) program administered by University College. It is recommended that you visit the Disabilities Office located in the Social Science Building Office 105 to register for the program at the beginning of each semester. For more information or to schedule an appointment, please contact Mrs. Kathy Brownlow, via phone or email at 662-254-3443 or kbrownlow@mvsu.edu.

Cheating, Plagiarism/Academic Integrity and Penalties:

Cheating is a serious offense and will not be tolerated. You are expected to complete your own work for homework assignments although you are encouraged to seek assistance from your

classmates. Do not use Mathway, Photomath or any other application for assignments that will be graded. Any student found cheating on homework or any other class activity will be subject to disciplinary action. Penalties for academic dishonesty might include the assignment of an "F" for the course grade and/or other administrative penalties consistent with the policies of the university.

Incomplete

Only students with acceptable excuses who could not complete the course requirements within the semester will be considered (through written request) for a grade of incomplete. The student must have a passing grade (**C or better**) up to the withdrawal date. Otherwise, students should drop or withdraw from the class.

Notes:

Students must show work to receive credit for their work on tests or for homework problems. Answers alone will not be accepted.

Cell phones should not be used at any time during the class period. It is preferred that cell phones not be visible. If you must use it, step outside the classroom.

Technology

Throughout the course, *Mathematica* will be used for problem-solving as well as for exploration and discovery. Students will complete assignments or projects using *Wolfram Mathematica*. The lab is equipped with *Mathematica* notebooks to accommodate each major area of study. Lab assignments must be completed in the lab and submitted at the end of each session. **Lab worksheets should not leave the lab.** Students will be given opportunity to use technology to execute complicated computations, to visualize theoretical concepts, to discover alternative approaches, or to verify the results of other solutions.

Useful *Mathematica* Commands:

| | |
|--|--|
| <code>f[x_]:=</code> | Defines a function $f(x)$ |
| <code>Plot[f[x], {x, a, b}]</code> | Plots the graph of $f(x)$ from $x = a$ to $x = b$. |
| <code>Expand[expression]</code> | Performs multiplication involved in the expression |
| <code>Simplify[expression]</code> | Simplifies the expression |
| <code>D[f[x],x]</code> or <code>f'[x]</code> | Differentiates the expression f with respect to x . |
| <code>Limit[f[x], x→a]</code> | Finds the limit of $f(x)$ as x approaches a . |
| <code>Solve [expr1 == expr2, x]</code> | Solve the equation $\text{expr1} = \text{expr2}$ for x . |
| <code>PlotRange→{a,b}</code> | Display y -axis from a to b . |

Others will be given in class as needed.

This document does not constitute a contract with the university. It contains guidelines and I reserve the right to make changes on this syllabus as needed.