College of Business, Engineering, Computer Science and Mathematics **Spring 2024**
MATH 112 Calculus for Business and Life Sciences (4,0) **4 Credits**

Prerequisites: MATH 111 or equivalent with a grade of C or better. This course will not count toward a major or minor in mathematics.

Instructor(s): George Voutsadakis, CAS 206E, 906-635-2667, gvoutsad@lssu.edu

Office Hours:

Monday	Tuesday	Wednesday	Thursday	Friday
	2:00 - 2:50	2:00 - 2:50	2:00 - 2:50	8:00 - 8:50 2:00 - 2:50

Required Texts: Brief Applied Calculus, Berresford and Rockett, 7th Edition, Brooks/Cole

Calculator: The TI-83 Plus/ TI 84 is the recommended calculator for this course. **On some of the exams and quizzes, the instructor may ask you to solve problems without using your calculators**.

Course Description: This is a brief calculus course with specialized applications intended for students in the biological, health, and business disciplines.

Course Goals: This course will include key concepts of Functions, Limits, Derivatives, Integrals, Differential equations, Appropriate applications.

Course Learning Outcomes: Upon completion of MATH 112, students will be able to:

1) **Function:**
(a) analyze, evaluate, and represent a function represented as a table, graph, or a formula. This includes slopes of linear models.
(b) construct complex functions using basic operations and functional composition.
(c) find, analyze, interpret models specific to business and life science applications.

2) **Limits:**
(a) describe intuitively the concept of limit and use limit notation correctly.
(b) find and interpret limits and asymptotes of functions.
(c) determine if a limit exits.
(d) use limits to algebraically find rate-of-change formulas.

3) **Derivative:**
(a) describe and interpret change, percentage change, average rate of change, instantaneous rate of change.
(b) use derivative notation, determine if a derivative exists, estimate rates of change when the derivative does not exist, and interpret in context.
(c) find derivatives using differentiation theorems (rules of differentiation).
(d) find rates of change at a point.
(e) find and interpret relative and absolute extreme values.
(f) determine concavity and find inflection points.

(g) find APY and APR in compound interest formulas, use marginal analysis to estimate output, optimize functions, solve related rates equations.

4) **Integral:**
(a) approximate areas under curves using rectangles and interpret this area.
(b) find general antiderivatives using appropriate techniques and recover a function using its derivative.
(c) find particular antiderivatives.
(d) describe intuitively and evaluate definite integrals and use these to calculate area and average value in business and life science settings.
(e) integrate using substitution.

5) **Differential equation:**
(a) find and graph particular solutions to differential equations.
(b) set up differential equations using information about direct, inverse, and joint proportionality.
(c) use slope fields to analyze a differential equation.
(d) find particular solutions to separable differential equations and apply these concepts to problems in business and life science.

General Education Objectives:
This course is designed to meet the Mathematics General Education Outcome. Students will be able to analyze situations symbolically and quantitatively in order to make decisions and solve problems.

This course contributes to LSSU's Institutional Learning Outcomes by addressing:

2.Analysis and Synthesis: Students will organize and synthesize evidence, ideas, or works of imagination to answer an open-ended question, draw a conclusion, achieve a goal, or create a substantial work of art.
3. Professional Responsibility: Students will demonstrate the ability to apply professional ethics and intercultural competence when answering a question, solving a problem, or achieving a goal.

Grading Scale and Policies:
__Point Values__:
Exams   200 points
Final exam   100 points
Quizzes   100 points
                                                                                          Total 400 points
__Grading Scale%__: **A** 90-100 (includes +/-) **B** 80-89 **C** 65-79 **D** 50-64 **F** 0-49

__Grading Policies__: You will be graded on correct methodology, i.e., if you provide an answer but show no work or your work is incorrect, you will receive no credit. Your solutions must be written in a connected, step-by-step logical fashion and all variables should be clearly defined. If your solution is not written clearly, you will not receive full credit. In many cases, setting up the correct mathematical model and using this model to solve a problem will be just as important as computing a numerical answer.

The homework exercises for each section covered are on the last page of this handout. You should spend a lot of your math study time doing homework. If you are struggling with your homework seek help from your instructor or the tutors in the Learning Center.

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Ground Rules:
1. Calculator: The TI-83/84 Plus is the recommended calculator for this course. Your instructor reserves the right to ask you to solve problems in class, during quizzes and during exams without the use of a calculator. <u>All other electronic devices (computers, PDAs, cell phones etc.), must be turned off for all class lecture sessions.</u>
2. Purpose of Lecture: Lectures are an opportunity for students to ask questions and seek clarification on material. This implies student preparation has been accomplished prior to class. Lecture is also the opportunity for the instructor to coordinate coverage of the material and present material that is historically or potentially difficult. It does not negate student preparation or study.
3. Attendance Policy: Attendance is strongly encouraged. If you miss a class, or are late, you are still responsible for class notes and assignments. Moreover, **you will be assigned a 0 score should a quiz take place during that missed lecture**.
4. Make-up Policy: Each exam should be taken at the designated time. An exam may be taken prior to or after the scheduled date, by agreement with the instructor, provided that the student provides a request with a **documented valid excuse well in advance of the scheduled date**. **If an absence is unexcused, no make-up will be provided, either for exams or for quizzes**.
5. Academic Integrity: Students are expected to perform all assigned work themselves. Any form of cheating or plagiarism will be handled in accordance with the Academic Integrity Procedures. Violations of the University Academic Integrity Policy may result in an F course grade.
6. **Testing:** <u>Use of head phones, cell phones and hats during exams is prohibited.</u>

University Policies and Statements:

Online and Blended Course Attendance Policy

Students in online or blended classes are required to log in to the Course Management System (Moodle) and complete at least one "Academic Related Activity" within the Add/Drop period.

The Americans with Disabilities Act & Accommodations

Lake Superior State University is committed to following the requirements of the Americans with Disabilities Act Amendments Act and Section 504 of the Rehabilitation Act. This university is also dedicated to providing equal opportunity for participation in all programs, services and activities. If you are a student with a disability or think you may have a disability, please contact Accessibility Services, KJS Library #233, (906) 635-2355, accessibility@lssu.edu to discuss your request further. Once you have registered with Accessibility Services, students should contact their instructor as early as possible for assistance with classroom accommodations.

Academic Success Center

To support you on your academic path, the Academic Success Center (ASC) is free for all students and is located on the main floor of the library. The ASC offers walk in sessions for the math center, consultations with the writing center, and tutoring sessions by appointment. In addition, many classes offer supplemental instruction, which are group sessions tailored to your course content. Contact the Academic Success Center at academicsuccess@lssu.edu to set up an appointment

Laker Success

The Laker Success program is designed to help you gain control over your learning through proactive communication and goal setting, through the development of learning skills and study habits, and through personal accountability. The Laker Success staff is committed to working with students to develop an individualized plan to achieve academic and personal goals. Students can initiate contact with Laker Success on their own via email at lakersuccess@lssu.edu or by visiting the Student Engagement Center in Cisler Center, Room 100. Students may be also directed to Laker Success by their advisor, by an instructor, by the Scholastic Standards / Financial Appeals Committees, or by the Provost's Office. If at mid-term your grades reflect that you may not attain a passing grade in one, some, or all of your classes, a Laker Success staff member will contact you. You may email lakersuccess@lssu.edu if you want to sign up early in the semester or if you have questions or concerns.

Add/Drop Policy

Courses can be added or dropped through Anchor Access until the sixth day of the semester (fourth day for the Summer semester). After this date, students need the instructor's permission to add a course. For additional details about add/drop or withdrawal, go to:
https://www.lssu.edu/registrar/scheduling/adddrop-courses-withdrawal-information/
Related dates for this semester can be viewed at: https://www.lssu.edu/registrar/important-dates/

Tentative course outline

Week	Dates	Monday	Tuesday	Wednesday	Thursday
1	01/15	MLK	1.1	1.2	1.3
2	01/22	1.4	1.4	2.1	2.1
3	01/29	2.1	2.2	2.2	2.3
4	02/05	2.3	2.4	Review	Exam 1
5	02/12	2.4	2.5	2.6	2.6
6	02/19	3.1	3.1	3.2	3.2
7	02/26	3.3	3.3	Review	Exam 2
8	03/04	BREAK	BREAK	BREAK	BREAK
9	03/11	3.4	3.4	3.6	3.6
10	03/18	4.1	4.1	4.2	4.2
11	03/25	4.3	4.3	Review	Exam 3
12	04/01	5.1	5.1	5.2	5.2
13	04/08	5.3	5.3	5.4	5.4
14	04/15	5.6	5.6	Review	Exam 4
15	04/22	6.1	6.1	6.3	6.5

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Assignments

Section	Exercises
1.1	7, 9, 15, 23, 31, 35, 39, 41, 43, 45, 46, 61, 63
1.2	1, 3, 5, 9, 11, 13, 15, 19, 21, 25, 27, 33, 35, 39, 41, 43, 45, 47, 57, 59, 61, 65, 67, 71, 73, 75
1.3	11, 13, 15, 19, 21, 23, 25, 27, 29, 35, 37, 39, 45, 49, 66, 67, 79, 81, 87
1.4	11, 13, 15, 19, 21, 27, 28, 33, 35, 41, 42, 45, 49, 51, 54, 57, 59, 61, 63, 67, 71, 74
2.1	13, 15, 18, 20, 21, 23, 25, 27, 31, 33, 35, 37, 39, 45, 47, 53, 55, 57, 59, 61, 63, 67, 71, 73
2.2	9, 15, 17, 19, 20, 21, 23, 25, 27, 39, 40, 41, 42, 55, 57
2.3	1, 3, 5, 9, 11, 13, 15, 17, 21, 23, 27, 31, 33, 37, 39a, 41a, 47, 52, 53, 55
2.4	5, 9, 13, 19, 21, 25, 27, 31, 35, 41, 43, 53, 55, 57, 61, 66, 75
2.5	1, 5, 7, 11, 13, 15, 17, 21, 25, 33, 36, 37, 39
2.6	1, 3, 7, 9, 11, 13, 15, 17, 23, 27, 31, 34, 37, 43, 47, 48, 51, 53, 57, 63
3.1	5, 7, 9, 15, 17, 19, 21, 23, 27, 31, 33, 35, 39, 43, 49, 55, 59, 66, 70
3.2	7, 9, 11, 15, 19, 25, 29, 41, 43, 45, 49, 51, 53, 57, 59, 60
3.3	1, 3, 7, 9, 11, 15, 19, 21, 25, 27, 31, 37, 39, 41, 45, 49
3.4	1, 3, 7, 9, 11, 13, 17, 21
3.6	1, 3, 5, 12, 15, 19, 23, 25, 29, 31, 37, 39, 41, 43, 53, 55, 57, 59, 63, 65, 69
4.1	3, 4, 5, 7, 13, 16, 19, 23, 25, 27, 35, 37, 43
4.2	1, 3, 5, 7, 9, 11, 13, 17, 21, 23, 27, 29, 31, 35
4.3	1, 2, 3, 5, 11, 12, 13, 21, 27, 29, 31, 37, 41, 45, 49, 51, 53, 55, 57, 79, 83, 87, 95
5.1	1, 3, 5, 7, 11, 13, 15, 17, 19, 23, 27, 30, 31, 35, 37, 43, 45, 49
5.2	1, 3, 7, 11, 15, 17, 19, 21, 25, 29, 31, 33, 35, 37, 43, 45, 51, 53
5.3	7ii, 9ii, 11ii, 19, 21, 23, 27, 29, 31, 35, 36, 39, 41a, 43a, 47, 49, 51, 53, 59, 63, 65, 77, 81, 85, 89
5.4	1, 3, 5, 9, 11, 15, 19, 29, 31, 33, 37, 39, 41, 43, 45, 49, 51, 53, 55, 57
5.6	1, 3, 5, 7, 9, 11, 13, 15, 19, 23, 25, 30, 31, 33, 35, 39, 41, 43, 45, 65, 67, 69, 71, 73
6.1	9, 11, 15, 17, 21, 25, 33, 35 (*), 37, 39, 41, 43, 47, 53, 55, 57, 59, 61
6.3	1, 3, 5, 7, 15, 17, 19, 21, 25, 27, 31, 35, 37, 51, 53, 56, 59
6.5	1, 5, 9, 11, 13, 19, 21, 25, 29, 31, 37, 41, 47, 55, 57, 61, 63