

College of Innovations and Solutions
MATH 112 Calculus for Business and Life Sciences (4,0)

Fall 2018
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 | 2:00 - 2:50 | 2:00 - 2:50 |

Required Texts: Brief Applied Calculus, Berresford and Rockett, Fifth 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 Objectives: Upon completion of MATH 112, students will be able to:

1) **Function:**

- analyze data to determine what type of function best models the data and then create the appropriate model.
- analyze, evaluate, and represent a function represented as a table, graph, or a formula. This includes slopes of linear models.
- construct complex functions using basic operations and functional composition.
- find, analyze, interpret models specific to business and life science applications.

2) **Limits:**

- describe intuitively the concept of limit and use limit notation correctly.
- find and interpret limits and asymptotes of functions.
- determine if a limit exists.
- use limits to algebraically find rate-of-change formulas.

3) **Derivative:**

- describe and interpret change, percentage change, average rate of change, instantaneous rate of change.
- use derivative notation, determine if a derivative exists, estimate rates of change when the derivative

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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.

Grading Scale and Policies:
Point Values:

| | |
|------------|-------------------------|
| Exams | 200 points |
| Final exam | 100 points |
| Quizzes | 100 points |
| | <u>Total 400 points</u> |

Grading Scale%:

| | | | |
|--------|----|-------|----|
| 94-100 | A | 70-74 | C |
| 90-93 | A- | 65-69 | C- |
| 87-89 | B+ | 60-64 | D+ |
| 84-86 | B | 55-59 | D |
| 80-83 | B- | 50-54 | D- |
| 75-79 | C+ | 0-49 | F |

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.

The course outline on the next-to-last page is a projection of the general structure and content of the course. It is tentative and subject to change without prior notice.

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. All other electronic devices, including computers, PDAs and cell phones, must be turned off for all class lecture sessions.
- 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:** Use of head phones, cell phones and hats during exams is prohibited.

University Policies and Statements:
The Americans with Disabilities Act & Accommodations

In compliance with Lake Superior State University policies and equal access laws, disability-related accommodations or services are available to students with documented disabilities.

If you are a student with a disability and you think you may require accommodations you must register with Accessibility Services (AS), which is located in the KJS Library, Room 130, (906) 635-2355 or x2355 on campus. AS will provide you with a letter of confirmation of your verified disability and authorize recommended accommodations. This authorization must be presented to your instructor before any accommodations can be made.

Students who desire such services should meet with instructors in a timely manner, preferably during the first week of class, to discuss individual disability related needs. Any student who feels that an accommodation is needed – based on the impact of a disability – should meet with instructors privately to discuss specific needs.

IPASS (Individual Plan for Academic Student Success)

If at mid-term your grades reflect that you are at risk for failing some or all of your classes, you will be contacted by a representative of IPASS. The IPASS program is designed to help you gain control over your learning through pro-active communication and goal-setting, the development of intentional learning skills and study habits, and personal accountability. You may contact 635-2887 or email ipass@lssu.edu if you would like to sign up early in the semester or if you have any questions or concerns.

Tentative course outline

| Week | Dates | Monday | Tuesday | Thursday | Friday |
|------|-------|--------|---------|----------|--------|
| 1 | 08/27 | 1.1 | 1.2 | 1.3 | 1.4 |
| 2 | 09/03 | BREAK | 2.1 | 2.1 | 2.2 |
| 3 | 09/10 | 2.3 | 2.4 | 2.4 | 2.5 |
| 4 | 09/17 | 2.6 | 2.6 | Review | Exam 1 |
| 5 | 09/24 | 3.1 | 3.2 | 3.2 | 3.3 |
| 6 | 10/01 | 3.3 | 3.4 | 3.4 | 3.5 |
| 7 | 10/08 | BREAK | 3.6 | Review | Exam 2 |
| 8 | 10/15 | 3.6 | 4.1 | 4.1 | 4.2 |
| 9 | 10/22 | 4.2 | 4.3 | 4.3 | 5.1 |
| 10 | 10/29 | 5.1 | 5.2 | 5.2 | 5.3 |
| 11 | 11/05 | 5.3 | 5.4 | Review | Exam 3 |
| 12 | 11/12 | 5.4 | 5.6 | 5.6 | 6.1 |
| 13 | 11/19 | 6.1 | 6.3 | BREAK | BREAK |
| 14 | 11/26 | 6.3 | 6.4 | Review | Exam 4 |
| 15 | 12/03 | 6.4 | 6.5 | 6.5 | Review |

Assignments

| Section | Exercises |
|---------|--|
| 1.1 | 7, 9, 15, 23, 31, 33, 35, 39, 41, 43 |
| 1.2 | 1, 3, 5, 9, 11, 13, 15, 19, 21, 25, 27, 33, 35, 39, 41, 43, 57, 59, 61, 65, 67, 71, 73, 75 |
| 1.3 | 11, 13, 15, 19, 21, 23, 25, 27, 29, 35, 39, 45, 49 |
| 1.4 | 11, 13, 15, 19, 21, 27, 28, 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, 61, 63, 67, 71, 73 |
| 2.2 | 9, 15, 17, 20, 21, 23, 25, 27, 39, 41 |
| 2.3 | 1, 3, 5, 9, 11, 15, 17, 21, 23, 27, 31, 33, 37, 39a, 41a, 45, 47, 55 |
| 2.4 | 5, 9, 13, 19, 21, 25, 27, 31, 35, 41, 43, 53, 57, 61, 66 |
| 2.5 | 1, 5, 7, 11, 13, 15, 17, 21, 25, 37, 39 |
| 2.6 | 1, 3, 7, 9, 11, 13, 15, 17, 23, 27, 34, 37, 43, 48, 51, 53, 58, 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, 57, 60 |
| 3.3 | 1, 3, 7, 9, 11, 15, 19, 21, 25, 31, 37, 41, 49 |
| 3.4 | 1, 3, 7, 9, 11, 17, 21 |
| 3.5 | 1, 3, 7, 9, 11, 13, 17 |
| 3.6 | 1, 3, 5, 12, 15, 19, 23, 25, 29, 31, 37, 41, 43, 53, 57, 60, 65 |
| 4.1 | 3, 4, 5, 7, 13, 15, 19, 27, 35, 37, 43 |
| 4.2 | 1, 3, 5, 7, 9, 11, 13, 17, 21, 23, 27, 31, 35 |
| 4.3 | 3, 5, 11, 13, 21, 27, 29, 31, 37, 41, 45, 49, 51, 53, 55, 69, 73, 75 |
| 5.1 | 1, 3, 5, 7, 11, 13, 15, 17, 19, 23, 27, 31, 35, 37, 43, 49 |
| 5.2 | 1, 3, 11, 15, 17, 21, 25, 29, 31, 33, 43, 45, 51, 53 |
| 5.3 | 7, 9, 11, 19, 21, 23, 27, 29, 31, 35, 36, 39, 41a, 43a, 47, 49, 53, 59, 63, 65, 77, 81, 84 |
| 5.4 | 1, 3, 5, 9, 11, 15, 19, 29, 31, 37, 39, 41, 43, 45, 49, 53, 55 |
| 5.6 | 1, 3, 5, 7, 9, 11, 13, 15, 19, 23, 25, 30, 31, 33, 35, 39, 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, 43, 51, 53, 56, 59 |
| 6.4 | 5, 7, 19, 23 |
| 6.5 | 1, 3, 5, 9, 11, 15, 19, 21, 25, 27, 31, 37, 41, 47, 55, 57, 59, 61, 63 |