

King Fahd University of Petroleum and Minerals
College of Computing and Mathematics
Department of Mathematics

Math 101 Syllabus – Term 213 (Summer 2022)

Coordinator: Dr. Mohamed Z. Abu-Sbeih

Title: Calculus I

Credit: 4-0-4

Textbook: Calculus (Early Transcendental) by J. Stewart, 8th edition, Brooks/Cole, 2016.

Objective: The objective of the course is to introduce students to the concepts of limits, continuity, differentiation, and their applications.

Description: Limits and continuity of functions of a single variable. Differentiability. Techniques of differentiation. Implicit differentiation. Local extrema, first and second derivative tests for local extrema. Concavity and inflection points. Curve sketching. Applied extrema problems. The mean value theorem and applications.

Learning Outcomes: Upon successful completion of this course, a student should be able to:

1. Compute various types of limits of functions of one variable.
2. Determine the region of continuity and types of discontinuity of a function.
3. Compute the slope of the tangent line at a point.
4. Calculate derivatives of polynomial, rational, trigonometric, inverse trigonometric, exponential, logarithmic, hyperbolic, piecewise and related functions.
5. Find extreme values, regions of monotonicity and concavity, asymptotes of a function of one variable.
6. Apply derivatives in estimating errors, approximating roots of equations via Newton's method and in solving optimization problems.
7. Recover some basic functions from their derivatives.

Grading Policy:

| Assessment | Date & Time | Material | Points |
|--|--|-----------------------------|-------------------|
| Exam 1 (18 MC Questions) | Tuesday 21 June, 2022: | Material: [2.1-2.8] | 90 (22.5%) |
| Exam 2 (18 MC Questions) | Monday 25 Jul, 2022: | Material: [3.1-3.11] | 90 (22.5%) |
| Final Exam (28 MC Questions) | TBA | Comprehensive | 140 (35%) |
| Recitation | | | 20 (5%) |
| Online Homework | On WebAssign (through Blackboard) | | 20 (5%) |
| Classwork | It is based on online quizzes, class tests, or other class activities determined by the instructor. The average of each section should be in the interval [28, 30]. | | 40 (10%) |
| TOTAL | | | 400 |

Letter Grades: The letter grades will follow a grading curve, which depends on the average of all students in the course.

Exam Questions: The questions of the exams are based on the examples, homework problems, and exercises in the textbook.

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of **DN** in the course along with reporting the incident to the higher university administration. Cheating in exams includes (but is not limited to)

- Looking at the papers of other students
- Talking to other students
- Using mobiles or any other electronic devices **including Smart Watch**

Missing an Exam: In case a student misses an exam (Exam I, Exam II, or the Final Exam) for a legitimate reason (such as medical emergencies), she/he must bring an official excuse from Students Affairs. Otherwise, she/he will get zero in the missed exam.

Attendance: Students are expected to attend all lecture and recitation classes.

- If a student misses a class, she/he is responsible for any announcement made in that class.
- A DN grade will be awarded to any student who accumulates
 - 9 unexcused absences in lecture and recitation classes.
 - 15 excused and unexcused absences in lecture and recitation classes.

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must take permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin on the Webpage of the Registrar.

Pacing Schedule

| Week | Date (2022) | Section | Topics |
|-------------------------------------|--------------------|----------------------------|---|
| 1 | June 5 – 9 | 2.1 2.2 2.3 2.4 | The Tangent Problem (Example 1). The Limit of a Function. Calculating Limits Using the Limit Laws The Precise Definition of a Limit (Examples 1, 2, 3) |
| 2 | June 12 -16 | 2.5 2.6 2.7 2.8 | Continuity Limits at Infinity; Horizontal Asymptotes Derivative and Rates of Change The Derivative as a Function + Exercise # 64 |
| 3 | June 19 -23 | 3.1 3.2 3.3 3.4 | Derivatives of Polynomials and Exponential Functions The Product and Quotient Rules Derivatives of Trigonometric Functions The Chain Rule |
| 4 | June 26 – 30 | 3.5 3.6 3.7 3.9 | Implicit Differentiation + Exercise # 77 Derivatives of Logarithmic Functions Rates of Change (Example 1) Related Rates |
| Hajj Holidays (July 03 – 14) | | | |
| 5 | July 17 – 21 | 3.10 3.11 4.1 4.2 | Linear Approximations and Differentials Hyperbolic Functions (Examples: 1 and 2) Maximum and Minimum Values The Mean Value Theorem |
| 6 | July 24 – 28 | 4.3 4.4 4.5 | How Derivatives Affect the Shape of a Graph Indeterminate Forms and L'Hospital's Rule Summary of Curve Sketching |
| 7 | July 31 – August 4 | 4.7 4.8 4.9 | Optimization Problems Newton's Method Antiderivatives |
| 8 | August 7 – 8 | - | Preparation for the final exam |

Homework Assignments

| Sec | Suggested Homework Problems | Recitation Problems | CAS* |
|-----|---------------------------------------|--|--------|
| 2.2 | 6, 12, 18, 36, 40, 44 | 9, 11, 17, 35, 37, 39, 41 | - |
| 2.3 | 12, 18, 22, 24, 26, 32, 51, 54 | 1, 9, 11, 17, 21, 25, 29, 53 | - |
| 2.4 | 2, 14, 18, 22 | 3, 5, 13, 17, 21 | - |
| 2.5 | 6, 12, 16, 20, 24, 34, 36, 40, 42, 46 | 3, 7, 13, 15, 17, 19, 21, 23, 29, 31, 35, 43, 45, 47, 49 | 34 |
| 2.6 | 6, 10, 14, 18, 24, 28, 36, 42, 50 | 3, 7, 13, 15, 17, 19, 25, 35, 39, 41, 49 | 45 |
| 2.7 | 6, 10, 14, 22, 28, 36, 38 | 7, 9, 13, 21, 23, 25, 29, 35, 39 | - |
| 2.8 | 2, 4, 8, 24, 28, 50, 62 | 1, 3, 9, 25, 29, 41, 49, 61 | 55 |
| 3.1 | 10, 24, 38, 50, 56, 70, 72 | 9, 23, 35, 37, 49, 55, 59, 61, 69, 71, 73, 75, 81 | 47, 60 |
| 3.2 | 6, 10, 20, 30, 32, 42, 46, 48, 52(d) | 5, 9, 11, 23, 29, 31, 41, 43, 49, 51, 53 | 38 |
| 3.3 | 6, 12, 22, 44, 52 | 3, 11, 23, 43, 49, 51 | - |
| 3.4 | 18, 26, 42, 50, 54, 62, 78 | 19, 25, 39, 53, 59, 61, 77 | - |
| 3.5 | 6, 14, 20, 22, 30, 58, 74(a), 78 | 7, 11, 15, 17, 21, 29, 57, 75, 77 | - |
| 3.6 | 12, 16, 18, 32, 34, 42, 48, 54 | 3, 9, 19, 31, 33, 41, 49, 53 | - |
| 3.7 | 2, 8 | 1, 3, 5, 9 | - |
| 3.9 | 4, 6, 12, 48 | 3, 7, 13, 19, 31 | - |
| 3.1 | 6, 16, 24, 28, 34 | 5, 17, 25, 27, 35 | 5 |
| 3.1 | 10, 20, 30, 46 | 7, 9, 21, 31, 57 | - |
| 4.1 | 10, 12, 28, 30, 34, 36, 42, 54 | 3, 5, 9, 11, 27, 33, 35, 39, 55, 57 | - |
| 4.2 | 4, 8, 12, 16, 20, 26 | 3, 7, 9, 13, 15, 19, 25, 33 | - |
| 4.3 | 14, 18, 20, 24, 36, 52 | 11, 13, 17, 21, 23, 25, 31, 35, 57 | 62 |
| 4.4 | 12, 14, 48, 52, 64 | 13, 15, 23, 25, 33, 47, 53, 57, 87 | 72 |
| 4.5 | 30, 44, 62, 72 | 19, 33, 37, 63, 71 | - |
| 4.7 | 2, 6, 14, 32 | 3, 5, 15, 23, 29, 31 | - |
| 4.8 | 8, 12, 22 | 7, 11, 17 | - |
| 4.9 | 6, 12, 20, 38, 44, 54, 62 | 7, 15, 19, 35, 37, 41, 51, 59 | - |

* CAS problems require the use of a technology tool (e.g., graphing calculators or a computer). You are encouraged to do these problems in order to enhance your understanding of the concepts involved.

Tips on how to enhance your problem-solving abilities:

1. Please do all the homework assignments on time.
2. You are urged to practice (but not memorize) more problems than the above lists.
3. You should always try to solve a problem on your own before reading the solution or asking for help.
4. If you find it difficult to handle a certain type of problems, you should try more problems of that type.
5. You should try the recitation problems before coming to class.
6. You are encouraged to solve some of the review problems at the end of each chapter.
7. The practice you get doing homework and reviewing the class lectures and recitations will make exam problems easier to tackle.
8. Try to make good use of the office hours of your instructor.