King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 101 Syllabus, Term 241 (2024-2025)

Coordinator: Dr. Ibrahim Al-Rasasi (irasasi@kfupm.edu.sa)

Course Code and Title: Math 101, Calculus I

Course Credit Hours: 4-0-4

Textbook: Larson, R. & Edwards, B., Calculus: Early Transcendental Functions, Metric Version, 7th edition, Cengage Learning, Inc., 2019.

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

Course 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.

Prerequisite: One-year preparatory mathematics or its equivalent.

Course Learning Outcomes: Upon successful completion of the 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, intervals 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:

	Date	Time	Place	Material	Percentage
Exam I (14 MCQ)	Monday Sep. 30			2.1-3.2 & 4.5	23.33% (70)
Exam II (14 MCQ)	Monday Nov. 4			3.3- 4.3	23.33 % (70)
Final Exam (20 MCQ)				Comprehensive	33.33% (100)
Online Homework	On Blackboard				5% (15)
Lab MATLAB	Midterm Exam: 7 points, 7 MCQ. Final Exam: 8 points, 8 MCQ.				5% (15)
Class Work	▪ It is based on quizzes, class tests, or other class activities determined by the instructor. ▪ The average (out of 30) of the class work of each section has to be in the interval $[y-1, y+1]$, where $y = \frac{3}{20}(madian(Ex\ 1)\% + median\ (Ex\ 2)\%)$.				10% (30)
				Total	100% (300)

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

Exam Questions: The questions of the exams are similar to the examples 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 for further action. Cheating in exams includes (but is not restricted to):

- Looking at the papers of other students.
- Talking to other students.
- Using mobiles, smart watches or any other electronic devices.

Other Exam Issues:

- No student will be allowed to take the exam if he/she does not bring his/her KFUPM ID, or National/Iqama ID, or Driver's License with him/her to the exam hall.
- Students are not allowed to have their mobiles, smart watches, or any electronic device in the exam hall. A violation of this will be considered an attempt of cheating.
- A student must sit in the seat assigned to him/her. A violation of this will be considered an attempt of cheating.

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), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get a score of zero in the missed exam.

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

- If a student misses a class/lab, he/she is responsible for any announcement made in that class/lab.
- After warned **twice** by the instructor, a DN grade will be awarded to any student who accumulates
    - 12 unexcused absences in lecture and lab classes. (20%)
    - 20 excused and unexcused absences in lecture and lab classes. (33.3%)

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 in the Registrar's website.

Coverage Plan

Week	Date (2024)	Sec	Title (24 sections)
1	Aug. 25-29		An Introductory class: Course Content, Grading Policy,…
		2.1	Preview of Calculus (Tangent Line Problem)
		2.2	Finding Limits Graphically and Numerically, up to page 75 (**No Formal Definition of Limit**) *
2	Sep. 1-5	2.3	Evaluating Limits Analytically
		2.5	Infinite Limits
3	Sep. 8-12	4.5	Limits at Infinity
		2.4	Continuity and One-Sided Limits
4	Sep. 15-19	2.4	Continued
		3.1	The Derivative and The Tangent Line Problem
Sunday & Monday, Sep. 22- 23: National Day Holidays			
5	Sep. 24-26	3.2	Basic Differentiation Rules and Rates of Change
↓ Exam I: Date: Monday, Sep. 30, 2024; Material: 2.1- 3.2 and 4.5			
6	Sep. 29- Oct. 3	3.3	Product and Quotient Rules and Higher-Order Derivatives
		3.4	The Chain Rule
7	Oct. 6-10	3.5	Implicit Differentiation + **Normal Lines (Ex. 63, 64)**
		3.6	Derivatives of Inverse Functions
8	Oct. 13-17	3.7	Related Rates
		3.8	Newton's Method
9	Oct. 20-24	4.1	Extrema on an Interval
		4.2	Rolle's Theorem and the Mean Value Theorem
10	Oct. 27-31	4.3	Increasing and Decreasing Functions and the First Derivative Test
↓ Exam II: Date: Monday, Nov. 4, 2024; Material: 3.3-4.3			
11	Nov. 3-7	4.4	Concavity and the Second Derivative Test
		5.6	Indeterminate Forms and L'Hopital's Rule
Nov. 10-14: Midterm Break			
12	Nov. 17-21	5.6	Continued
		4.6	A Summary of Curve Sketching
13	Nov. 24-28	4.6	Continued
		4.7	Optimization Problems
14	Dec. 1-5	4.8	Differentials
		5.1	Antiderivatives and Indefinite Integration
15	Dec. 8-12	5.9	Hyperbolic Functions (**Derivatives & Antiderivatives, Up to Example 3**)
16	Dec. 15-16		**Review/ Catching up**
Final Exam: Comprehensive			

*: **Suggestion:** One-Sided limits (in Section 2.4) can be covered after Section 2.2.

Suggested Practice Exercises

Sr.	Sec	Exercises #
1	2.1	4, 5, 7, 8 (4 problems)
2	2.2	6, 11, 14, 22, 24, 26, 27, 29, 32, 34, 72 (11 problems)
3	2.3	10, 13, 18, 22, 27, 34, 36, 40, 42, 45, 46, 50, 55, 62, 67, 68, 72, 73, 89, 92, 95, 96, 100 (25 problems)
4	2.4	6, 7, 10, 14, 15, 19, 21, 25, 28, 32, 35, 36, 38, 39, 41, 50, 54, 56, 59, 63, 75, 78, 81, 84, 89, 101, 103, 129 (28 problems)
5	2.5	4, 5, 8, 9, 12, 13, 16, 17, 18, 22, 23, 24, 34, 35, 38, 39, 43, 56 (18 problems)
6	4.5	12, 14, 16, 18, 24, 26, 30, 34, 36, 40, 50, 51 (12 problems)
7	3.1	14, 15, 25, 27, 36, 40, 42, 44, 46, 53, 56, 60, 78, 80, 88, 90, 97 (17 problems)
8	3.2	6, 12, 14, 22, 25, 30, 32, 41, 47, 50, 54, 60, 67, 69, 74, 96, 97, 104, 107, 113, 117 (21 problems)
9	3.3	9, 13, 21, 24, 25, 35, 36, 43, 57, 60, 65, 71, 79, 83, 85, 87, 92, 104, 111, 130 (20 problems)
10	3.4	5, 8, 15, 23, 26, 35, 43, 51, 58, 65, 73, 87, 95, 100, 102, 108, 115, 120, 125, 144, 148, 154, 156, 167, 176 (25 problems)
11	3.5	7, 15, 23, 27, 29, 33, 35, 41, 45, 47, 52, 57, 60, 63, 66, 71, 79, 85, 95 (19 problems)
12	3.6	3, 5, 15, 17, 19, 25, 27, 33, 43, 47, 52, 54, 60, 64, 70, 73 (16 problems)
13	3.7	3, 6, 9, 13, 15, 17, 18, 21, 23, 25, 29, 35, 37, 42, 45 (15 problems)
14	3.8	3, 5, 9, 11, 13, 17, 20, 21, 25, 27, 34, 37 (12 problems)
15	4.1	5, 7, 10, 11, 13, 15, 17, 24, 29, 34, 35, 45, 47, 53, 57, 69 (16 problems)
16	4.2	3, 9, 14, 16, 17, 42, 46, 48, 50, 54 (10 problems)
17	4.3	8, 12, 16, 20, 28, 32, 38, 42, 44, 54, 60, 62, 71, 76, 88 (15 problems)
18	4.4	4, 8, 14, 16, 22, 24, 28, 30, 34, 42, 44, 50, 54, 58, 67, 75 (16 problems)
19	5.6	2, 3, 8, 10, 18, 22, 30, 32, 43, 47, 48, 55, 58, 63, 65, 69, 72, 79, 82, 103 (20 problems)
20	4.6	6, 12, 22, 26, 28, 34, 36, 38, 41, 44, 50, 53 (12 problems)

21	4.7	6, 12, 14, 16, 18, 20, 22, 24, 25 (9 problems)
22	4.8	6, 8, 12, 18, 26, 30, 38, 40, 48, 50 (10 problems)
23	5.1	6, 10, 14, 18, 20, 26, 30, 34, 38, 42 (10 problems)
24	5.9	7, 15, 19, 23, 30, 35, 40, 44 (8 problems)

Note: Check also the **True-or-False** exercises in each section.

Some tips to enhance your problem-solving skills:

- Do all homework assignments on time.
- Practice (but not memorize) more problems than those given in the above list.
- Solve some review exercises available at the end of each chapter.
- Solve the problems on your own before reading the solution or asking for help.
- If you find it difficult to handle a certain type of problems, you should try more problems of the same type.
- Try to make good use of the office hours of your instructor. Always bring your solution trials to discuss them with your instructor.