King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 101 Syllabus, Term 243 (2024-2025)
Coordinator: Dr. Ibrahim Al-Rasasi (irasasi@kfupm.edu.sa)

Title: Math 101

Credit: 4-0-4

Textbook: Calculus: Early Transcendental Functions, Metric Version, 7th edition, by Ron Larson and Bruce Edwards.

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

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.

The Grading Policy:

	Date and Time	Place	Materials	Weight
Exam I **(14 MCQ)**			[2.1-3.3] and 4.5	70 points
Exam II **(14 MCQ)**			[3.4-4.2]	70 points
Final Exam **(20 MCQ)**	TBA		Comprehensive	100 points
Rec. Lab **MATLAB**	Midterm Exam: 10 points Final Exam: 20 points			30 points
Classwork	▪ It is based on quizzes, class tests, or other class activities determined by the instructor. ▪ The average x (out of 30) of the classwork of each section should be in the interval $[y-1, y+1]$, where $y = \dfrac{3\,(median(Exam\ I)\% + median(Exam\ II)\%)}{20}$			30 points
			TOTAL	300 points

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, 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

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 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 being warned at least twice by his/her instructor, a DN grade will be awarded to any student who accumulates more than
  o 10 unexcused absences in lecture and lab classes. (20%)
  o 16 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 on the Registrar's website.

The Pacing Schedule

Week	Date (2025)	Section	Topics (24 sections)
1	June 15-19	2.1	Preview of Calculus (Tangent Line Problem)
		2.2	Finding Limits Graphically and Numerically (No formal Definition of the limit) (Up to page 75) *
		2.3	Evaluating Limits Analytically
		2.5	Infinite Limits
2	June 22- 26	4.5	Limits at Infinity
		2.4	Continuity and One-Sided Limits
		3.1	The Derivative and the Tangent Line Problem
3	June 29-July 03	3.2	Basic Differentiation Rules and Rates of Change
		3.3	Product and Quotient Rules and Higher-Order Derivatives
		3.4	The Chain Rule
Exam I: [2.1-3.3] and 4.5		
4	July 06-10	3.5	Implicit Differentiation + Normal Lines Exercises 63-64
		3.6	Derivatives of Inverse Functions
		3.7	Related Rates
		3.8	Newton's Method
5	July 13- 17	4.1	Extrema on an Interval
		4.2	Rolle's Theorem and the Mean Value Theorem
		4.3	Increasing and Decreasing Functions and the First Derivative Test
Exam II: [3.4-4.2]		
6	July 20- 24	4.4	Concavity and the Second Derivative Test
		5.6	Indeterminate Forms and L'Hôpital's Rule
		4.6	A Summary of Curve Sketching
7	July 27- 31	4.7	Optimization Problems
		4.8	Differentials
		5.1	Antiderivatives and integration
		5.9	Hyperbolic Functions and Their Derivatives and Antiderivatives (Up to Example 3)
8	Aug. 3- 4		Review/ Catching up
Final Exam (Comprehensive, MCQ): Date & Time to be decided by the Registrar		

* Suggestion: One-Sided Limits (in Section 2.4) can be explained after Section 2.2

Suggested Practice Problems:

Sec	Suggested Practice Problems
2.1	4, 5, 7, 8
2.2	6, 11, 12, 14, 16, 21, 24, 26, 27, 29, 34, 71, 72
2.3	6, 10, 13, 18, 22, 23, 27, 34, 36, 40, 42, 45, 46, 50, 54, 55, 62, 67, 68, 72, 73, 89, 92, 95, 96, 100, 126
2.4	6,7,10, 14, 15, 19, 21, 25, 28, 32, 35, 36, 38, 39, 41, 48, 50, 54, 56, 63, 75, 78, 81, 84, 89, 101, 103, 129
2.5	4, 5, 6, 8, 9, 10, 12, 13, 16, 17, 18, 22, 23, 24, 34, 35, 36, 38, 39, 43, 44, 56
3.1	9, 10, 12, 14, 15, 20, 25, 27, 29 , 32 , 36 , 40, 42, 44, 47, 53, 56, 60, 67, 78, 80, 88, 90, 97
3.2	6, 7, 10, 14, 19, 22, 25, 30, 32, 34, 41, 46, 50, 51, 54, 57, 60, 67, 69, 74, 96, 97, 100, 104, 107, 113, 117
3.3	5, 7, 11, 13, 21, 23, 25, 27, 35, 36, 43, 45, 56, 57, 58, 65, 71, 79, 85, 92
3.4	5, 7, 13, 15, 23, 26, 35, 37, 43, 46, 51, 53, 57, 65, 67, 73, 87, 95, 100, 102, 108, 115, 120, 124, 148, 154, 156, 176, 177
3.5	5, 7, 15, 17, 27, 29, 31, 33, 35, 39, 41, 43, 45, 47, 49, 55, 57, 59, 61, 63, 66, 71, 72, 85, 89, 95
3.6	3, 5, 15, 17, 19, 25, 27, 33, 35, 43, 45, 47, 52, 53, 60, 64, 67, 68, 69, 70, 73
3.7	3, 5, 7, 9, 13, 15, 17, 18, 19, 21, 23, 25, 27, 29, 35, 37, 42, 43, 45
3.8	3, 5, 7, 9, 11, 13, 15, 17, 20, 21, 24, 25, 27, 34, 37
4.1	5, 7, 10, 11, 13, 15, 17, 23, 25, 27, 34, 35, 45, 47, 51, 53, 57, 69, 72
4.2	8, 14, 16, 18, 42, 44, 48, 50, 54
4.3	6, 8, 12, 16, 20, 24, 30, 32, 38, 42, 44, 60, 62, 71, 76, 88, 105
4.4	4, 8, 10, 14, 16, 22, 24, 28, 30, 34, 38, 42, 44, 50, 54, 58
4.5	12, 14, 16, 18, 20, 24, 26, 30, 34, 36, 40
5.6	2, 3, 6, 8, 10, 18, 22, 30, 32, 43, 47, 48, 52, 55, 58, 63, 65, 69, 72, 79, 82, 103, 116
4.6	6, 12, 22, 26, 28, 34, 36, 38, 42, 44, 50, 52
4.7	6, 12, 14, 16, 18, 20, 22, 24, 26, 36
4.8	6, 8, 12, 18, 22, 26, 30, 38,40, 48, 50
5.1	6, 10, 12, 14, 16, 20, 22, 26, 30, 34, 36, 38, 42, 44
5.9	15, 19, 23, 30, 35, 40, 44

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.

We wish you all the best of luck.