

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics**  
**Math 101 – Syllabus (Term 223)**  
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**Title:** Math 101

**Credit:** 4-0-4

**Textbook:** Calculus: Early Transcendental Functions, Metric Version, 7<sup>th</sup> 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	Place	Materials	Percentage
<b>Exam I (18 MCQ)</b>	Wednesday, 12 July, 2023	Building 54	[2.1-3.3] and 4.5	22.5% (90 pts)
<b>Exam II (18 MCQ)</b>	Monday, 31 July, 2023	Building 54	[3.4-4.3]	22.5% (90 pts)
<b>Final Exam (28 MCQ)</b>	TBA		Comprehensive	35% (140 pts)
<b>Online Homework</b>	On WebAssign (through Blackboard)			5% (20 pts)
<b>Recitation</b>	Please check with the recitation instructor			5% (20 pts)
<b>Classwork</b>	<ul style="list-style-type: none"> <li>▪ It is based on quizzes, class tests, or other class activities determined by the instructor.</li> <li>▪ The average <math>x</math> (out of 40) of the classwork of each section should be in the interval <math>[y - 1, y + 1]</math>, where <math>y = \frac{\text{median}(\text{Exam I})\% + \text{median}(\text{Exam II})\%}{5}</math></li> </ul>			10% (40 pts)
<b>TOTAL</b>				<b>100% (400 pts)</b>

**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 doesn't bring his/her KFUPM, National, or Iqama ID Card 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 student must sit for the exam in the seat assigned to him/her.

**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 recitation classes.

- If a student misses a class, he/she is responsible for any announcement made in that class.

- After being warned at least twice by his/her instructor, a DN grade will be awarded to any student who accumulates
  - 10 unexcused absences in lecture and recitation classes.
  - 16 excused and unexcused absences in lecture and recitation classes.

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

### The Pacing Schedule

Week	Date (2022)	Section	Topics
<b>1</b>	June 11-15	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
<b>2</b>	June 18-22	4.5	Limits at Infinity
		2.4	Continuity and One-Sided Limits
		3.1	The Derivative and the Tangent Line Problem
<b>Eid Break</b>			
<b>3</b>	July 09-13	3.2	Basic Differentiation Rules and Rates of Change
		3.3	Product and Quotient Rules and Higher-Order Derivatives
		3.4	The Chain Rule
<b>First Major Exam: Wednesday, 12 July, 2023 [2.1-3.3] and 4.5</b>			
<b>4</b>	July 16-20	3.5	Implicit Differentiation + Normal Lines Exercises 63-64
		3.6	Derivatives of Inverse Functions
		3.7	Related Rates
		3.8	Newton's Method
<b>5</b>	July 23-27	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
<b>Second Major Exam: Monday, 31 July, 2023, [3.4-4.3]</b>			
<b>6</b>	July 30 – Aug 03	4.4	Concavity and the Second Derivative Test
		5.6	Indeterminate Forms and L'Hôpital's Rule
		4.6	A Summary of Curve Sketching
<b>7</b>	Aug 06 - 10	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)
<b>8</b>	Aug 13 - 14	Review/ Catching up	
<b>Final Exam (Comprehensive, MCQ): Date &amp; Time to be decided by the Registrar</b>			

\* Suggestion: One-Sided Limits (From 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

### Tips on how to enhance your mathematical skills and achieve better grades:

1. Do all your homework assignments on time and make good use of the office hours of your instructor.
2. You are urged to practice as many problems as you can.
3. You should always try to solve any problem by yourself first before reading the solution or asking for help.
4. If you find it difficult to handle a certain type of problem, do more problems of the same type.
5. When practicing some problems, time yourself to finish your solution before reading answers. That is, adapt yourself to the exam environment.
6. Solve some of the review problems at the end of each chapter.

We wish you all the best of luck,