King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 101 Syllabus, Term 212 (2021-2022)

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

Title: Calculus I

Credit: 4-0-4

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

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.

Prerequisite: One-year preparatory mathematics or its equivalent.

Learning Outcomes: Upon completion of the course, students 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 a tangent line at a point.
4. Calculate the derivatives of polynomials, 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 solving optimization problems.
7. Recover some basic functions from their derivatives.

Grading Policy:

Exam I	Date: Sunday, Feb. 20	Place:	22.5% (90 points)
(18 MCQ)	Time: 5:30pm	Material: **[2.1-2.7]**	
Exam 2	Date: Sunday, March 27	Place:	22.5% (90 points)
(18 MCQ)	Time: 6:00pm	Material: **[2.8-3.9]**	
Final Exam	Date:	Place:	35% (140 points)
(28 MCQ)	Time:	Material: Comprehensive	
Online Homework	In WebAssign through Blackboard		5% (20 points)
Recitation			5% (20 points)
Class Work	It is based on quizzes, class tests, attendance, or other class activities determined by the instructor. Any quiz or test under class activity should be of **written type and not of multiple-choice type.** The average (out of 40) of class activities **of each section** should be in the interval [28, 30].		10% (40 points)

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

- ✓ **Exams' 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 F 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 or any other electronic devices.

- ✓ **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 must bring an official excuse from Students Affairs. Otherwise, he will get zero in the missed exam.

- ✓ **Attendance:** Students are expected to attend all lecture classes.
  - ➢ If a student misses a class, he is responsible for any announcement made in that class.
  - ➢ A DN grade will be awarded to any student who accumulates more than 20% unexcused absences (9 lectures) or 33% excused and unexcused absences (15 lectures)

  Note: Absences are counted as follows:
    - For UTR-Lectures, missing one lecture is counted as 1 absence.
    - For MW-Lectures, missing one lecture is counted as 1.5 absence.

- ✓ **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.

Pacing Schedule

Week	Dates (2022)	Section	Topics (26 sections)
1	Jan. 16- 20	2.1	The Tangent and Velocity Problems
		2.2	The Limit of a Function
2	Jan. 23- 27	2.3	Calculating Limits Using the Limit Laws
		2.4	The Precise Definition of a Limit (**Examples 1, 2, 3)**
3	Jan. 30- Feb. 3	2.4	Continued
		2.5	Continuity
4	Feb. 6- 10	2.6	Limits at Infinity; Horizontal Asymptotes
		2.7	Derivatives and Rates of Change
5	Feb. 13- 17	2.8	The Derivative as a Function + **Exercise # 64**
		3.1	Derivatives of Polynomials and Expo. Functions
6	Feb. 20- 24	3.2	The Product and Quotient Rules
		3.3	Derivatives of Trigonometric Functions
	Exam I: Sunday, Feb. 20; [2.1 – 2.7]		
7	Feb. 27- March 3	3.4	The Chain Rule
		3.5	Implicit Differentiation + **Exercise # 77**
8	March 6- 10	3.6	Derivatives of Logarithmic functions
		3.7	Rates of Change (In Physics: Example 1)
9	March 13- 17	3.9	Related Rates
		3.10	Linear Approximations and Differentials
10	March 20- 24	3.11	Hyperbolic Functions (Up to Example 2)
		4.1	Maximum and Minimum Values
11	March 27- 31	4.2	The Mean Value Theorem
	Exam II: Sunday, March 27; [2.8 – 3.9]		
12	April 3- 7	4.3	How Derivatives Affect the Shape of a Graph
		4.4	Indeterminate Forms and L'Hospital's Rule
13	April 10- 14	4.4	Continued
		4.5	Summary of Curve Sketching
14	April 17- 21	4.7	Optimization Problems
		4.8	Newton's Method
	Eid Al-Fitr Holiday		
15	May 8- 12	4.9	Antiderivatives
			REVIEW and/or CATCHING UP
	Final Exam (MCQ): (Comprehensive)		

Suggested Practice Problems

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:

- ✓ Do all homework assignments on time.
- ✓ Practice (but not memorize) more problems than those in the above list.
- ✓ Solve review problems 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.
- ✓ Practicing homework problems and reviewing the class lectures will make exam problems easier to tackle.
- ✓ Try to make good use of the office hours of your instructor. Always bring partial solutions of the questions that you want to discuss with your instructor.