

King Fahd University of Petroleum & Minerals
Department of Mathematics and Statistics

MATH 411-Term 092

Instructor: Professor Abdelkader Boucherif

Course Syllabus

Recommended Text: “A First Course in Real Analysis” by Protter & Morrey, 2nd Ed, Springer (1991)

Main Topics to be Covered: The vector space \mathbf{R}^N , distance, norm, inner product. Sequences and Series of functions, Continuity and differentiability of functions of several variables, Partial derivatives, the chain rule, Taylor’s Theorem, Maxima and Minima, Integration of functions of several variables, Convergence and divergence of improper integrals, Derivative of functions defined by improper integrals.

Course Objectives: This course is designed to provide a rigorous mathematical basis for the analysis of “Functions of several variables” and improper integrals. The student may have seen some of the above topics during his sophomore calculus course. However, most of this material as well as the level of rigor are all new to the student.

Students Learning Outcome: After completion of the course, the students should be able to

- Gain familiarity with functions of several variables
- Be able to understand and write proofs of theorems
- Be able to manipulate improper integrals
- Apply the results to solve exercises, mostly theoretical in nature

Computer Usage: Computer software is not required in this course, however, the student is encouraged to use packages such as Maple, Mathematica, ... etc.

Course Evaluation Policy:

Exam I: 25%; Exam II: 25%; Final Exam: 40% ; Homework 10%

Policy about Unexcused Absences: KFUPM policy on unexcused absences will be followed.

Office #: 5-417

Phone: 4194

e-mail: aboucher@kfupm.edu.sa

Office Hours: SMW: 10:15 AM-11:30 AM or by appointment

Weekly Coverage of Course Material

Week	Date	Section	Topic	Suggested Homework
1	Feb. 20-27	6.1-6.4	The Vector space \mathbf{R}^N	
2	March 1-3		The Vector space \mathbf{R}^N (continued)	
3	March 6-10	7.1 7.2	Partial Derivatives and the Chain Rule Taylor's Theorem; Maxima and Minima	1,2,4,5,6,8
4	March 13-17	7.2 7.3	Taylor's Theorem; Maxima and Minima-suite The Derivative in \mathbf{R}^N	1,2,3,7,8,11 2,4,7,8
5	March 20-24	8.1	Volume in \mathbf{R}^N	1,4
6	March 27-31	8.3	The Riemann Integral in \mathbf{R}^N	2,3,5,6,7
7	April 3-7	9.1 9.2	Tests for Convergence and Divergence Series of Positive and Negative Terms; Power Series	13,16,17,18 3,8,12,16,24,26
8	April 10-14	9.3 9.4	Uniform Convergence of Sequences Uniform Convergence of Seires; Power Series	1,7,12,17,18 1,10,11,28,37
***	April	17-21	Midterm Vacation	*****
9	April 24-28	9.4	Uniform Convergence of Seires; Power Series (Continued)	
10	May 1-5	9.5-9.7	Unordered sums- Comparison tests Multiple sequences and series	1,4,6,8,14
11	May 8-12	10.1- 10.3	Fourier Series	
12	May 15-19	11.1	The Derivative of a function Defined by an Integral; the Leibniz Rule	1,3,10,14,18
13	May 22-26	11.2	Convergence and Divergence of Improper Integrals	3,7,12,13,14
14	May 29- June 2	11.3	The Derivative of Functions Defined by Improper Integrals; the Gamma Function	3,7,9,10,14,22
15	June 5-9		Reviews	