

King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

Math.411-2011-2012
Term111

Course Instructor: Dr. A. Boucherif

Recommended Text: “Function of Several Variables” by Wendell Fleming, 2nd Ed, Springer (1977)

Main Topics to be Covered: Theory of 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”.

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
- Apply the results to solve exercises, mostly theoretical in nature
- Prepare the students for higher level analysis courses

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 35% Homework 15%

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

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Weekly Coverage of Course Material

Wk	Date	Material
1	Sept. 10-14	Sequences and Series of Functions: Sequences and Series of numbers, Pointwise and Uniform Convergence of Sequences of Functions
2	Sept. 17-21	Power series, the Euclidean space \mathbf{R}^N
3	Sept. 24-28	The Euclidean space \mathbf{R}^N (continued) Functions, Limit and Continuity, Sequences in \mathbf{R}^N
4	Oct. 1-5	Bolzano-Weierstrass Theorem, Relative Neighborhood, continuous transformations
5	Oct. 8-12	Directional and Partial Derivatives, Linear Functions, Differentiable Functions, Functions of class $C^{(q)}$
6	Oct. 15-19	Minima, Maxima, and Taylor Formula
7	Oct. 22-26	Taylor Formula (continued), Convex and Concave Function
8	Oct. 29-31	The Inverse Function Theorem.
	Nov. 1-11	Eid Al-Adha Vacation
9	Nov. 12-16	The Implicit Function Theorem and applications
10	Nov. 19-23	Integration of functions of several variables: Integrals over bounded sets, Iterated integrals
11	Nov. 26-30	Integrals of Continuous Functions, Transformations of Integrals
12	Dec. 3-7	Convergence and divergence of improper integrals, Differentiation under the integral sign
13	Dec. 10-14	Differentiation under the integral sign (continued)
14	Dec. 17-21	L^p -Spaces
15	Dec. 24-28	Catching up /or Review