MATH118b
Introduction to Functions of Several Variables
Spring 2004, Yale University

Lectures: TuTh 9.00-10.15; WLH 208
Instructor: Ann B. Lee (email: ann.lee@yale.edu)
Room 502 in Watson Bldg; Phone: 2-1290
Office hours: Mon 4-5, Wed 4-5
Text: Sydsaeter/Hammond, Mathematics for Economic Analysis, John Wiley & Sons, 1995. Supplementary material will be distributed in class.

This class consists of two parts: linear algebra (6 weeks) and multivariable calculus (7 weeks). Emphasis is on topics and mathematical techniques that are especially important to students in economics and social sciences. The goal of the class is to deepen the student’s conceptual understanding and geometric intuition for key ideas in linear algebra and calculus of several variables, as well as provide the student with a working knowledge of the mathematics they need the most in applications and modeling.

A prerequisite for the class is a sound knowledge of single-variable differentiation, integration and optimization (Math 112 or equivalent).

Course Work and Grading Policy: There will be weekly homework assignments, one midterm and a final. The final grade will approximately be based 30% on the homework, 30% on the midterm and 40% on the final exam where the latter is comprehensive.
Tentative Schedule

**Linear Algebra**
- **Week of 1/12**: Course orientation. Systems of linear equations in two variables. Basic terms and geometric interpretation.
- **Week of 1/19**: Vectors, lines and planes. Linear independence and spanning sets. Definition of a basis.
- **Week of 1/26**: Solving linear equations by Gaussian elimination. Rank of a matrix.
- **Week of 2/2**: Rules for matrix operations. Inverse of a matrix. Determinants.
- **Week of 2/9**: More on linear systems of equations. Orthogonal projections and least squares approximations (*). Vector spaces and subspaces attached to a matrix (*).
- **Week of 2/16**: Linear transformations (*). Eigenvalues and eigenvectors.

**2/23/04**  *Midterm* (preliminary date)

**Multivariable Calculus and Optimization**
- **Week of 2/23**: Review of one-variable calculus.
- **Week of 3/1**: Functions of several variables. Geometric representation. Partial derivatives and tangent planes.
- **Week of 3/29**: Multivariable optimization: Local and global extrema. Quadratic forms and definite matrices (*).
- **Week of 4/5**: Constrained optimization using Lagrange multipliers. Guide to programming problems (*).
- **Week of 4/12**: Review of one-variable integral calculus. Double integrals in rectangular coordinates.
- **Week of 4/19**: Polar coordinates and change of variables in a multiple integral (*). Review and wrap-up.

**5/3/04**  *Final exam*

Some of the topics marked by (*) may be omitted depending on the time constraints. As a rule, the lectures and the homework problems define the course.