Math 138A
Winter 2004

BACKGROUND MATERIAL

The background references are given usisng the Department's standard texts for courses in single and multivariable calculus, linear algebra and discrete mathematics.

ORDINARY AND MULTIVARIABLE CALCULUS

Calculus with Analytic Geometry (Seventh Edition), by R. E. Larson, R. P. Hostetler and B. E. Edwards. Houghton Mifflin, 2002.

Applications of integration (§ 6.4)

> Arc length, surfaces of revolution.

Conics, parametric equations and polar coordinates (§ 9.1–9.6)

> Conics and calculus, plane curves, parametric equations, polar coordinates.

Vectors and geometry (§ 10.1–10.5)

> Vecors and coordinates in the plane and 3-dimensional space, dot and cross products, lines and planes in space, surfaces in space, cylindrical and spherical coordinates.

Vectopr valued functions (§ 11.1–11.5)

> Definitions, differentiation and integration, velocity and acceleration, tangent and normal vectors, arc length.

Functions of several variables (§§ 12.1–12.7)

> Baisc properties, limits and continuity, partial differentiation, first order approximations, chain rules, directional derivatives and gradients, tangent planes and normal lines.

Basic Multivariable Calculus, by J. E. Marsden, A. J. Tromba and A. Weinstein

Partial differentiation (§§ 2.1–2.6)

> Graphs of level surfaces, partial derivatives and continuity, differentiability, the derivative matrix and tangent planes, the chain rule, gradients and partial derivatives, implicit differentiation.

Higher derivatives and extrema (§§ 3.1–3.4)

Higher order partial derivatives, Taylor's Theorem, maxima and minima, second derivative test.

Vector valued functions (§§ 4.1–4.4)

Acceleration, arc length, vector fields, divergence and curl.

LINEAR ALGEBRA

Linear Algebra, Third Edition, by J. Fraleigh and R. Beauregard

Vectors, matrices and systems of linear equations (§§ 1.1–1.6)

Euclidean vectors, norm and dot product, matrices and their algebra, solving systems of linear equations, inverses of square matrices, homogeneous systems, their solution subspaces and bases for the latter.

Dimension, rank and linear transformations (§§ 2.1–2.4)

Independence and dimension, the rank of a matrix, linear transformations of Euclidean spaces, specialization to the plane.

Vector spaces (§§ 3.1–3.5)

The abstract notion of a vector space, generalization of linear algebraic concepts from ordinary vector algebra, coordinatization of vectors, linear transformations, inner product spaces.

Determinants (§§ 4.1–4.4)

2×2 and 3×3 determinants and their relations to areas, volumes and cross products, the determinant of a general square matrix, compuations of determinants and Cramer's rule.

DISCRETE MATHEMATICS*

Discrete Mathematics and its Applications, Fifth Edition, by K. H. Rosen

[* This is a reference for the set-theoretic notation that is needed in the course.]

Logic, set theory and functions (§§ 1.6–1.8)

Sets, operations on sets, functions.