MATH 215 Vector Calculus SYLLABUS

Prof. Sachs Fall 2013

TEXT: Notes from me along with access to a regular calculus text

COURSE OVERVIEW: This course introduces the ideas and techniques of multivariable calculus and explores their uses. Extending calculus takes several forms: vector-valued functions of one variable; scalar and vector functions of several variables. Throughout we will emphasize conceptual understanding using the idea of linear approximation, which leads to a better view of how these ideas and techniques were developed. Vector and matrix algebra organize calculations and clarify reasoning. Computer calculation and visualization will be used often.

WARNING: We will be experimenting with some alternate sequencing of topics. Given the traditional textbook order of topics, this will be uncomfortable in a few spots.

MEETING: Mon. and Wed. 5:55–7:10 pm, Exploratory Hall 4106

OFFICE HOURS: Mon. and Wed., 4:30-5:45pm, Exploratory 4211, and by appt.

CONTACT INFO: OFFICE PHONE: 703-993-1464 E-MAIL: rsachs@gmu.edu

COURSE WEB PAGE: math.gmu.edu/~rsachs/math215

GRADING: Grading will be fair and impartial. Points used as the basis of the grade will be: Hmwk. (200 pts.); Mathematica/Applet hmwks (50 pts.); Class Participation (50 pts.); Exams (300 pts.); Final exam (150 pts.).

POLICIES: The GMU Honor code is in effect at all times and students are expected to be fully aware of its requirements. Group work may be part of the course, in which case group members will truthfully report on non-contributing members. Absence from quizzes and exams must be for a valid reason and requires prior notification except in extreme circumstances. DO NOT ARRANGE TO LEAVE BEFORE THE FINAL EXAM. If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

IMPORTANT DATES: Last day to add/ drop, no tuition liability Sept. 3
Last day to drop without dean's signature Sept. 27, 5pm

EXAMS: Exam 1 **Tentative** Wednesday, Sept. 25
Exam 2 **Tentative** Wednesday, Oct. 30
Exam 3 **Tentative** Monday, Nov. 18
Final Exam **Definitely** Mon. 12/16 4:30 pm 7:15 pm

(over)

MATERIAL COVERED AND TENTATIVE DAILY SCHEDULE

8/26; 8/28 Overview of course; 2-D and 3-D coordinates; vectors (dot product, cross product); orientation; rotation; matrices

9/4 Equations of lines, planes; functions of one and several variables; graphing issues.

9/9, 9/11 Functions of two and three variables: graphs, level sets, limits, continuity.

9/16, 9/18 Curves in space; Curvature and torsion; planetary motion; line integrals.

9/23, 9/25 Functions of several variables: partial derivatives, linear approximation, gradient vector, drawing gradient field.

9/30, 10/2 Solving for gradient – curl and divergence introduced; Chain rule

10/7, 10/9 Max-min problems; constraints and Lagrange multiplier rule. Integral in 2-D: rectangles.

10/15, 10/16 2-D general domains, polar coordinates. Integral in 3-D: boxes, general domains, cylindrical and spherical coordinates.

10/21, 10/23 Substitution in integration; Start applications of integration.

10/26, 10/28 More applications of integration: surface area, average values.center of mass, moments.

11/4, 11/6 Integration over lower dimensional objects: surface integral; vector form.

11/12, 11/14 Independence of path in line integrals and Fundamental Theorem for line integrals; Green's theorem. Divergence form for flux.

11/18, 11/20 Exam 3. Flux and circulation.

11/25 Reviewing flux and circulation; additive properties.

12/2, 12/4 Extending Green's theorem into 3-D: Stokes' theorem and Gauss' theorem. Review and summary.

Along the way, we will talk about some themes: dimensionality, parametrization, approximation, and use computer software (Mathematica) and on-line applets to aid in visualization and calculation.