›nors Multivariable Calculus, Mathematics 265, Fall 1997 SYLLABUS

.me and Place: MWF 10:40-11:30 A.M. CCMB, Room 328 Lab: Th, 11:00-11:50 A.M. ›bartolo, Room 204

:ofessor: Frank Connolly, Room 235, CCMB Office Hours: MW 12:15-1:15P.M., ıd by appointment.

›xt: CALCULUS, v.2, by Tom Apostol, second edition(1969)

ıterial to be covered: Chapter 1, sections 1 -14. Chapter 14 of volume (handout), sections 1 - 21 Chapter 8, sections 1 - 24. Chapter 9, ›ctions 1 - 17. Chapter10, sections 1- 18 Tests: Friday, ›ptember 19 Friday, October 17 Friday, November 21 Final Exam: ıesday, December 16, 8:00-10:00 A.M.

:ades: Each test will be worth 100 points; the final exam will be ›rth 150 points; homework will be worth 50 points. Quizzes (which .ll always be announced beforehand) will be worth a total of no more ıan 50 points. Work on all tests and quizzes should, of course, be :rictly your own.

.l homework should be done on looseleaf paper. Sheets torn out of ›tebooks, with ragged edge, will not be accepted. Homework which is :itten in an illegible script, or in a disorganized manner, will not › accepted. Use complete english sentences in all written work. ›ecial care should be taken to use the appropriate logical ›nnectives, in order to make arguments coherent.

:udents may ask others for help with their homework, and also work ›gether when they choose to do so. However, it is unwise to do the ›mework exclusively in a group; there is no substitute for the insight ıat comes from individual concentration.

.near Algebra and Inner Products:

›ctor spaces; bases; linear independence; inner products; the L-2 ıner product in function spaces; orthogonality; Cauchy Schwarz ıequality; orthogonal functions; orthogonal projection and ›ast-squares approximation; Gram Schmidt orthogonalization method; ›urier Polynomials; the Legendre polynomials as an orthonormal set.

ırves in euclidean space and their derivatives; the cross product in -space; the velocity and acceleration vectors; curvature and arclength : curves; the cycloid and the 4-cusped hypocycloid; Kepler's laws of .anetary motion.

.fferential Calculus of Scalar Fields and Vector Fields:

›en sets and open balls in euclidean space; Linear functionals and .near transformations; real valued functions of a vector variable;

ontinuity and differentiability of scalar fields; partial derivatives; ie gradient and total derivative of a scalar field; functions with ontinuous partial derivatives are differentiable; equality of mixed irtial derivatives; the Laplacian of a scalar field; the chain rule; evel surfaces of scalar fields and their tangent planes; the total erivative of a vector valued function; the Jacobian matrix; the chain ile for vector fields; polar coordinates; differential 1-forms.

oplications of Differential Calculus:

iplace's equation; the heat equation; the wave equation for functions : one space variable; Jacobian determinants and implicit .fferentiation; maximums and minimums of scalar fields; the Hessian iadratic form and the second derivative test for scalar fields; igrange multipliers.

oherical Coordinates? Cylindrical coordinates? Inverse Function ieorem? .

.ne Integrals:

.ne integral of a vector field; Line integral of a scalar field; Line itegral of a differential 1-form; mass and centroid of a wire; moment : inertia; work and line integrals; connected open sets; the indamental theorems of calculus for line integrals; potential inctions for vector fields and integrals for differential 1-forms; how o construct potential functions; how to solve an exact differential juation; integral curves for differential 1-forms; closed 1-forms are xact on convex open sets. Chapter 6, sections 1-20. Ordinary

.fferential Equations:

olutions of first order linear inhomogeneous equations. The general olution of a second order homogeneous linear equation with constant oefficients. The general case of constant coefficient linear .fferential operators and equations. The method of variable oefficients (Wronskian method) and the annihilator method for solving ihomogeneous linear equations. Power series solutions for second order .near equations. The Legendre differential operator as a self-adjoint oerator. The solutions of the Legendre differential equations and ieir relation to the Legendre orthogonal polynomials.

iplace's equationRelation between the Heat Equation in 3-variables id the Legendre Differential Equation; the Inverse Function Theorem