

## Ma 213 Calculus III – Syllabus – Fall 2007

**Text:** *Calculus* 5<sup>th</sup> edition by James Stewart.

**Prerequisite:** Ma 114 Calculus II or equivalent.

**Topics:** This is our first course in the calculus of several variables. The topic list is fairly standard for such a course. They are covered in Chapters 13, 14, 15, 16, and the first 4 sections of Chapter 17 of the text. Briefly, they are

1. Analytic geometry of 3 dimensions: Cartesian coordinates, distance function, graph of an equation in three variables, equations for spheres, lines, planes, cylinders, quadric surfaces, parameterizing curves and surfaces, cylindrical and spherical coordinates, choosing the right coordinate system for the problem.
2. Vector algebra in 2 and 3 dimensions: properties of vector addition, scalar multiplication, dot product, and cross product, unit vectors, parallel vectors, normal vectors, vector and scalar projections, angle between vectors, vector equations for lines and planes, use of vectors to solve basic geometric problems such as distance from a point to a line, point to a plane, angle between two intersecting lines or planes.
3. Vector valued functions and the differential geometry of parameterized curves: limits, continuity and derivatives of vector functions, tangent line to a curve, differentiation rules, length of a curve, parameterization by arc length, position, velocity and acceleration of a moving point, unit tangent, normal, and binormal, curvature, osculating plane, recovering the position vector from given information.
4. Functions of several variables -- partial derivatives and applications: graphs, level curves and surfaces, limits and continuity at a point, partial derivatives, differentiability, gradient, directional derivatives, local extrema, second derivative test, max-min problems, least squares approximation, Lagrange multipliers.
5. Functions of several variables –multiple integration and applications: Riemann sums, double and triple integrals in Cartesian, cylindrical and spherical coordinates, iterated integrals, volume, mass, average value, first moments, center of mass, second moments, radius of gyration, change of variables.
6. Vector calculus: line integrals, vector fields, work, conservative vector fields, Green's theorem.

Some teachers may wish to go further into vector calculus, depending on their class.

**Homework, exams, etc:** This is not a uniform exam course, so teachers can schedule homework, exams, etc. at their convenience. By custom, there are at least two midterm exams given during the semester in addition to the final exam. There is a set of whs homeworks available, if you wish to use them. See the course coordinator for details. Each teacher is expected to mentor and monitor the teaching assistants who are assigned to teach the recitations with their course.

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