MATH 226: Honours Multivariable calculus

Course outline.

Textbook

Adams and Essex, Calculus (edition 8). The course will cover Chapters 10,12,13,14.

Exams and Marking

Course mark will be based on the homework, which is a mix of webwork and written assignments (approximately 15%), two midterms (35% together) and the final exam (50%).

The two midterms will not overlap in the material covered. The final exam will cover the entire course.

Syllabus

The course covers differentiation/integration theory of real-valued functions of several real variables. The emphasis will be on **ideas** and **computation**. We will also discuss some simple proofs in detail (and by the end, you will be expected to write simple formal proofs well, and to identify things that need to be proved). More complicated theorems will have the outline of the main ideas of the proofs, sometimes without detail.

The topics covered will include:

- Cartesian coordinates in $\mathbb{R}^n$, equations of lines, planes, cylinders, etc; the notion of open/closed sets; quadric surfaces; cylindrical and spherical coordinates.

- Vectors: elementary operations, dot product, projections. Cross product in $\mathbb{R}^3$.

- Functions of several variables: the notions of continuity and differentiability.

- Partial derivatives.

- Linear approximations and differentials.

- Gradients and directional derivatives.

- Implicit functions

- Extreme values, Lagrange multipliers.

- Double and triple integrals; integration in cylindrical and spherical coordinates; change of variables formula.

- Some other topics and applications as time permits.