School of Mathematics

Module MA1131 — Advanced calculus 2010-11
(JF Mathematics, JF Theoretical Physics & JF Two-subject Moderatorship
SF Mathematics, SF Two-subject Moderatorship)

Lecturer: Professor Richard Timoney

Requirements/prerequisites:

Duration: Michaelmas term, 11 weeks

Number of lectures per week: 3 lectures including tutorials per week

Assessment: Regular aassignments and tutorial work.

ECTS credits: 5

End-of-year Examination: Continuous assessment. Supplemental examination only.

Description: Functions, graphs, limits, derivatives and rules for differentiation. Implicit differentiation. Linear approximation in one variable. Sign of the derivative, critical points. Trigonometric, exponential, log and hyperbolic functions, arbitary powers. Inverse functions, inverse trigonometric and hyperbolic functions. Integrating factors for constant coefficient linear differential equations.

Differentiation of curves, tangent lines in 2 or 3 dimensions. Graphical represenation of functions of 2 or 3 variables. Partial derivatives, gradients, directional derivatives, tangent planes to graphs and level surfaces. Linear approximation for functions of 2 or 3 variables, chain rule.

Techniques of integration (finding antiderivatives via substitution, integration by parts, partial fractions). Fundamental theorem of integral calculus (statement and examples).

Double and triple integrals, computation via iterated integrals (Fubini theorem). Double integrals in polar coordinates.

Refer to `http://www.maths.tcd.ie/~richardt/MA1131` for more information.

Learning Outcomes: On sucessful completion of this module, students will be able to:

- calculate derivatives and partial derivatives for a range of algebraic and transcendental functions (including trigonometric functions, exponential, logarithm, hyperbolic functions and inverses);
- apply the standard results and concepts concerning differentiation in a number of appropriate contexts (such as graphical or geometric interpretations of tangents, critical points, linear approximation, solving simple linear differential equations);
- compute single integrals for a range of integrands using appropriate combinations of methods (such as substitution, integration by parts and partial fractions);
- compute double and triple integrals by application of Fubini's theorem or use change of variables;

- use integrals to find quantities defined via integration in a number of context (such as average, area, volume, mass).

November 17, 2010