School of Mathematics

Course 135 — JF Computer Science/CSLL Mathematics (1BA1) 1998-99
(JF Computer Science)

Lecturer: Colm Ó Dúnlaing

Requirements/prerequisites: None

Duration: 24 weeks

Number of lectures per week: 2 + 1 tutorial

Assessment: About 20 homeworks; 2-hour tests at beginning of Hilary and Trinity terms.

End-of-year Examination: One 3-hour paper

Description:

Vectors in 2 and 3 dimensions; cartesian coordinates. Equations of lines and planes. Parametric descriptions of lines and planes. Dot and cross products in 2 and 3 dimensions; orthogonality. Systems of linear equations, Gauss-Jordan elimination,

General vector spaces. Linear dependence. Vector subspaces and bases. Change of basis, change of coordinates. Matrix arithmetic; determining invertibility and calculating inverse. Linear transformations and matrices; matrix of a transformation with respect to different bases; Kernel of a linear transformation; row and column spaces of a matrix.

Determinants: sign of a permutation, determinants defined, calculation through upper triangular form, determinants and elementary matrices, product rule, cofactor expansions, Cramer's rule, adjoint formula for inverse matrix.

Limits, continuous functions, derivatives, higher derivatives. Rolle's Theorem, Mean value Theorem. Maximising/minimising functions. Tangents, curve sketching, linear approximation. Newton-Raphson method. Definite integral of a function. Fundamental Theorem of the Calculus. Antidifferentiation. Integration by parts. Trapezoidal method, Simpson's Rule. Taylor's Theorem. Calculation of Taylor series.

Partial differentiation. Tangent plane. Maximising/minimising functions of two variables.

Ordinary differential equations: separable, , linear (variation of parameters), second order constant-coefficient linear ODEs. Derivation of some simple ODEs.

Recurrence equations: summation, linear, second order constant-coefficient linear. Applications to algorithm analysis.

June 10, 1998