School of Mathematics

Course 121 - Introduction to Analysis   2007-08
(JF Mathematics, JF Theoretical Physics, JF Two-Subject Moderatorship, SF Two-Subject
Moderatorship)

Lecturer: Dr. Paschalis Karageorgis

Requirements/prerequisites: Some mathematical intuition

Duration: Full year

Number of lectures per week: 4 + 1 tutorial

Assessment: Homework Homework assignments every other week. Exams at the end of the
Michaelmas term and at the end of Hilary term.

End-of-year Examination: A 3-hour paper.

Description: See `http://www.maths.tcd.ie/~pete/maths121/` for more complete informa-
tion.
  The course will cover the following topics, yet not necessarily in the order listed.

- A short introduction to mathematical logic and proofs

- Definition of the real numbers (using Dedekind cuts)

- Definition and properties of min/max/inf/sup

- Logarithms, powers and roots

- Definition and properties of limits; limits at infinity

- Definition and properties of derivatives

- Definition of continuity; continuous and discontinuous functions

- Intermediate value and Mean value theorems

- Applications of derivatives in optimization problems

- Definition and properties of (in)definite integrals

- Techniques of integration; the Fundamental Theorem of Calculus

- Infinite and power series; tests for convergence

- Taylor's Theorem; binomial and exponential series

- Applications of integrals in computations of area

- Surfaces of revolution and their volumes

- Double integrals and polar coordinates

- Fubini's Theorem

- Basic Theory for ordinary differential equations (ODE)

- Separable and 1st-order linear ODE

- 2nd-order ODE with constant coefficients

- Homogeneous and non-homogeneous ODE

Textbook. Although there is no official textbook for the course, some typical references are

1. Calculus by Michael Spivak,

2. Principles of mathematical analysis by Walter Rudin,

3. Differential and integral calculus by Edmund Landau.

February 1, 2008