

Analysis II: MA139

Keith Ball

Weekly plan

Week 1

Introduction

Radius of convergence of power series

Continuity of power series.

Week 2

The exponential and its characteristic property.

Inequalities for the exponential.

The logarithm and powers.

Limits of functions.

Week 3

Limits: relation to continuity.

The derivative.

The sum and product rules. Polynomials.

Week 4

Local linearisation and the chain rule.

Rolle's Theorem and the Mean Value Theorem.

Uniqueness of solutions of ordinary differential equations. Extrema and derivatives.

The derivatives of inverses.

Week 5

The differentiability of power series.

The derivative of the exponential.

The differentiability of \log .
The trigonometric functions.
The addition formulae.

Week 6

$\cos^2 + \sin^2 = 1$.
Radians and the choice of the exponential.
An introduction to L'Hôpital's rule.
Cauchy's Mean Value Theorem.
The proof of L'Hôpital.

Week 7

Introduction to Taylor's Theorem.
Taylor's Theorem with The Lagrange remainder.
The log series and binomial series.
Introduction to the Riemann integral.

Week 8

Upper and lower sums.
Refinements
The integral.
The integrability condition.

Week 9

The integrability of continuous functions.
Linearity and monotonicity.
Continuous functions of integrable functions.
First form of the Fundamental Theorem of Calculus.

Week 10

Second form of the Fundamental Theorem of Calculus.
Substitution.
Improper integrals.