Introduction

M.Sc. in Mathematical Modelling & Scientific Computing,
Practical Numerical Analysis

Michaelmas Term 2025

Introduction to Practical Numerical Analysis

- Lectures: 4pm on Mondays in L2 in weeks 1–8 and 10am on Wednesdays in L5 in weeks 1, 3, 5, 7, 8.
- After week 1, the Monday lecture will go through concepts and the Wednesday lecture will go through the problem sheets.
- In weeks 2, 4 and 6 there will be no formal session on Wednesday but we will use this as a drop in session for questions about PNA.
- There will be four problem sheets to be submitted on Mondays by 10am in weeks 3, 5, 7, 8.
- Idea is to learn to programme algorithms by a set of examples from Numerical Analysis.
- Our TAs will be Vedanta Thapar and Francesco Hrobat.
- Course materials, including lecture recordings, slides and problem sheets, will be available from https://courses.maths.ox.ac.uk/course/view.php?id=6264.

Content

Topics we will look at are

- Interpolation
- Quadrature
- Rootfinding
- ODEs (initial value problems)
  - Simple Euler schemes
  - Runge Kutta schemes
  - Linear multistep methods
- Parabolic PDEs — the heat equation

Lectures

The idea of the Monday lectures (and Wednesday in week 1) is to summarise the ideas for a topic. While there may be theorems stated, there will not be many proofs — this is meant to be a practical course.

Problem Sheets

Submissions: you will submit solutions to all problem sheets for marking by a TA.

Solutions: will be presented in Python, but you may code in Matlab if you prefer.

- If you choose to use Python, a Jupyter notebook is recommended, but then export as a pdf for submission.
- If you choose to use Matlab, please use "publish" to convert your Matlab code to pdf (see online guide).

In either case, please ensure the pdf contains a listing of all functions you use.

All solutions should contain code and results as well as an explanation or interpretation of results. (Do your results match with theory, if not why not etc.)