

Dear Mathematics Freshers,

We are looking forward to welcoming you to Wadham in October. This letter is intended to help you prepare for the start of your Mathematics degree. We are the three tutors who will be organising your first-year tutorials and we are writing with some suggestions based on our experience of teaching first-year students.

Some of the first-year courses build directly on mathematics you have met at school, though at a much faster pace. Others, particularly Analysis and Linear Algebra, introduce a more abstract and proof-based style of mathematics, which may feel quite new at first. To help you prepare for this step-change, there is an excellent guide called 'How do Undergraduates do Mathematics?':

http://www.maths.ox.ac.uk/system/files/attachments/study_public_1.pdf

This has a lot of general explanation but also some detailed material illustrating how the degree course will demand a new level of logical thought and the writing of clear and rigorous proofs. Developing confidence with this more abstract style of mathematics is an important part of the first year.

We expect you to be completely familiar with all your A-level (or equivalent) school work. The lecture courses move quickly, so very little time in lectures, if any, will be spent revising school material. Please use the summer to identify and fill any gaps you may have in your mathematical knowledge. For this purpose, the Mathematical Institute provides a set of practice problems

<http://www.maths.ox.ac.uk/study-here/undergraduate-study/practice-problems>

which you should work through. In the first week of Michaelmas Term we will be running tutorials to discuss your solutions to these problems. You do not necessarily need to write up detailed solutions for exercises you can confidently solve, but please do keep a note of which problems you found novel or difficult so that you remember to discuss these in the Week 1 tutorials. Your school textbooks should be enough, but there is a recommended book, D. W. Jordan and P. Smith, *Mathematical Techniques*, 4th ed., OUP, 2008, which would give extra depth. As a particular and important example, you must regard the Taylor series in Sheet 5 as being as basic as $2+2=4$. At school you may have thought of these series as a collection of various weird facts, safe to forget about. But these become important tools very quickly in both pure and applied mathematics. By the time you arrive, you should aim to be completely comfortable working with the standard geometric, binomial, logarithmic, exponential, sine and cosine series.



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We would also encourage you to work your way through Stephen Siklos's booklet *Advanced Problems in Mathematics: Preparing for University*. The PDF version is freely available here:

<https://www.openbookpublishers.com/product/1050>

The solutions are particularly rewarding as they guide you through the thought processes involved in solving problems.

More generally, it is a good idea to read about modern mathematics to give you some idea of where you are heading. The books of Ian Stewart and Marcus du Sautoy, for instance, will lead you into fascinating topics. A particularly beautiful classic is the book:

R. Courant and H. Robbins, *What Is Mathematics? An Elementary Approach to Ideas and Methods*.

There are also many excellent mathematical resources online. Wikipedia can be useful for getting an initial overview of an unfamiliar topic or checking terminology, although once the course begins the online lecture notes and other course materials should normally be your first point of reference.

Do not worry if some of this feels unfamiliar or difficult: learning how to tackle unfamiliar mathematics is an important part of the first year, and we will help you develop those skills in tutorials.

With best wishes,

Alexander Ritter
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Mark Mezei

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