MSM2P01 Sequences and series

Dr. Richard Kaye

Autumn term, 2013

Lectures   Tuesdays 12:00-12:50 and Thursdays 14:00-14:50 in Watson LRB.

Examples classes   Tuesdays 13:00-13:50 in Watson LRC on EVEN weeks of term, starting in the second week of term. (I shall count the weeks 1,2,3,...,11. So classes are weeks 2,4,6,8,10. If you prefer to start counting at 6 then classes are in weeks 7,9,11,13,15.)

Assessment deadlines   All students will have fortnightly work to hand in by 13:00 on Fridays of weeks 2,4,6,8,10 in the white box.

Office hours   Tuesdays 10:00 to 10:50, Thursdays 13:00-13:30, in room 308. I will be available at these times to help individual queries, etc.

Email   R.W.Kaye@bham.ac.uk

Web   http://web.mat.bham.ac.uk/R.W.Kaye/teaching/modules/msm2p01/

Canvas   At the moment there is no online site apart from my web pages. I find that making material available online can encourage some students to skip lectures. *Do not skip lectures—these will be your main source of information for the course and are essential.*

Total workload   There are 27 hours of lectures and classes. This half of the module is expected to contain about 100 hours work. That means you are also expected to find your own time to study your notes during term time as well as the revision at Easter. This includes reading through exercise notes and attempting exercises, but doing just this will not be enough. At a *minimum* there will be one hour extra for each lecture and each exercise class. Most students should do more than the minimum.

Learning and revision   This is a university 'pure maths' module, and as such is different from anything you did at School, and different from most maths work in year 1. You will find that there are a number of definitions, theorems and even some proofs to be learnt. For most people this is something new that they never had to do before. It is also very important.

  (a) The right way to learn definitions and theorems is to understand what they are saying. When you do understand them there will be much less to learn. Most definitions and theorems can be written in one of many equivalent forms, and I shall never require you to use a particular form: any of the equivalents will suffice.

(b) Many students put off this learning for the easter vacation revision period. Do not do this! If you start learning as you go along you will save time considerably because you will be able to do the work faster and you will have less to learn at Easter.

(c) All exams in the summer contain a large number of easy questions that eveyone will be able to do. In this module the easy questions are of the form 'state the definition of X' and 'state the Y theorem'. As well as testing your memory this also tests your writing abilities and understanding of the course, since you do not learn these by rote but rather by understaning them. *If you fail to learn these definitions you risk failing.*

Assessment arrangements   The (full) module MSM2P01 is assessed both continuously and by a final 3 hour examination covering work from both parts of the module.   The continuous assessment is from five exercise classes, and the best 4 of the 5 will count. However, the main reason for the exercise classes is not to give you marks but to allow you to test your knowledge and understanding as we go along. Note that all exercise classes are 'open book' and so I cannot ask 'bookwork questions' such as 'give the definition of an X'. Such bookwork questions will be a major part of the exam and you must prepare for them.

Topics to be covered this term

1. **Introduction:**   correct use of mathematical language; revision of modulus and inequalities, harder inequalities; introduction to 'analysis'.

2. **Sequences:**   the idea of a sequence; convergence; theorems on limits; monotonic sequences; subsequences; Bolzano–Weierstrass Theorem.

3. **Series:**   convergence; series of positive terms; geometric series; comparison test; absolute convergence; ratio test.

4. **The real numbers:**   Axiomatic approch to $\mathbb{R}$; infs and sups; completeness.

Textbook   I will not insist you buy a textbook, and expect you will be able to get very good notes by attending lectures. If you do want a text, Hart's 'Guide to analsis' (Palgrave) is recommended. There is a considerable amount of material on the web, including web pages of my own, and I will provide links later.

Printed notes   Some printed handouts will be provided for revision purposes. I believe short summary notes are much more useful than long over-detailed notes which may appear daunting. If you need more than the summary notes, check out a text book or web pages.