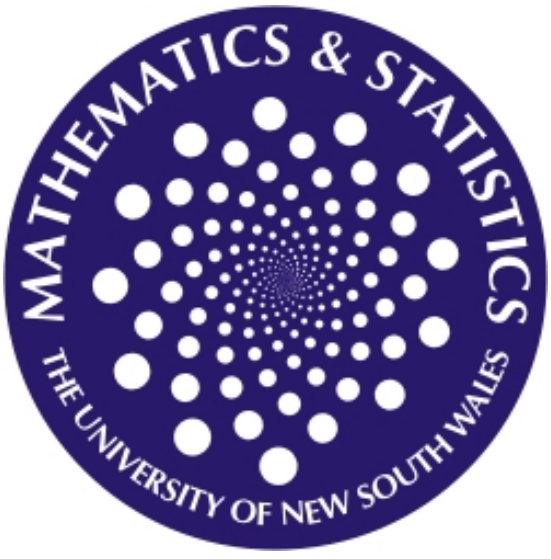
UNSW
THE UNIVERSITY OF NEW SOUTH WALES

FACULTY OF SCIENCE
SCHOOL OF MATHEMATICS AND STATISTICS

MATH3570

FOUNDATIONS OF CALCULUS

Session 1, 2009



MATH3570 – Course Outline

Information about the course

Course Authority & Lecturer: David Crocker, Office RC-3094, phone 9385-7062, email `davidj@maths.unsw.edu.au`

Consultation: Consultation hours will be announced in Week 1. Please use email if you wish to arrange an appointment.

Credit, Prerequisites, Exclusions:

This course counts for 3 Units of Credit (3UOC).

Course prerequisites are at least 12 units of credit in second year mathematics courses. MATH3570 is a compulsory course for all students intending to teach High School Mathematics. It is also relevant to applications of mathematics in physics and engineering.

Exclusions: MATH3610, MATH3611, MATH3620, MATH5705

Lectures and Tutorials: There will be two classes a week:

Thursday	9 – 10 am	OMB-113	All weeks
Friday	9 – 10 am	OMB-113	All weeks

There will be **tutorials** at the **first** class of weeks 4 and 6 and at the **second** class of weeks 7,10 and 12 based on problem sheets which will be handed out for each topic.

In Week 8 the first class will be a preparation tutorial for the Mid-Session Test to be held at the second class of Week 8.

One class is lost due to Good Friday (W5 C2 10/4/09).

See the later section Syllabus and Class Schedule.

Attendance at all classes will be recorded.

My eLearning on Web: The MATH3570 web pages at the UNSW My eLearning web site will have links to PDFs of any printed materials for this course - Outline Lecture Notes, Problem sheets, Assignments, Assignment Solutions, Past Mid-Session Tests and Exams and Solutions.

There will also be a link here to the Schools Student Web Portal so that students may check their assessment marks have been correctly recorded.

Course aims

This course aims to re-examine the key ideas behind the Calculus and to give a deeper understanding of the notions of limit, continuity, differentiability and integrability. We may also deal with sequences and series of functions and examine the concept of uniform convergence. Students will

gain an understanding of the underlying concepts of Calculus and rigorously justify ideas which they have previously met at an intuitive level. The emphasis throughout will be on proof rather than applications.

Relation to other mathematics courses

This course which is compulsory for Mathematics Education majors is designed to give the theoretical background that underpins high school and University Calculus.

Student Learning Outcomes

Students taking this course will develop an appreciation for the theoretical and logical basis for the main results of one variable Calculus.

The ability to provide logical and coherent proofs of Calculus results, and the ability to solve Calculus problems via abstract algebraic methods will be paramount.

Through regularly attending lectures and applying themselves in tutorial exercises, students will develop competency in mathematical presentation, written and verbal skills.

Relation to graduate attributes

The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: 1.**Research, inquiry and analytical thinking abilities**, 4. **Communication**, 6. **Information literacy**

Teaching strategies underpinning the course

New ideas and skills are introduced and demonstrated in lectures, then students develop these skills by applying them to specific tasks in tutorials and assessments.

Rationale for learning and teaching strategies

We believe that effective learning is best supported by a climate of enquiry, in which students are actively engaged in the learning process. To ensure effective learning, students should participate in class as outlined below.

We believe that effective learning is achieved when students attend all classes, have prepared effectively for classes by reading through previous lecture notes, in the case of lectures, and, in the case of tutorials, by having made a serious attempt at doing for themselves the tutorial problems prior to the tutorials.

Furthermore, lectures should be viewed by the student as an opportunity to learn, rather than just copy down lecture notes.

Effective learning is achieved when students have a genuine interest in the subject and make a serious effort to master the basic material.

The art of logically setting out mathematics is best learned by watching an expert and paying particular attention to detail. This skill is best learned by regularly attending classes.

Assessment

Assessment in this course will consist of

1. two assignments (10% each), due at the end of weeks **5** and **11**;
2. one 50 minutes mid-session test (20%) at the **Thursday 9 am class of week 8**, covering the first 4 topics of the course;
3. a 2 hour final examination (60%) in the June examination period covering the entire course.

The Assignments will be distributed by the second class of weeks 3 and 9 and are due no later than

- **Thursday 4 p.m. of week 5 for Assignment 1**; (Note Friday of week 5 is Good Friday)
- **Friday 4 p.m. of week 11 for Assignment 2**.

If assignments are not handed in at class, they must be handed to me **in person** at my office or left at the School's General Office RC-3070 if I am not in my office.

In the assignments and the mid-session test, marks will be awarded for correct working, logical setting out and appropriate explanations an not just the final answer. The main rationale for the assignments and test is to give students practice and feedback on logic and the setting out of proofs and arguments in the context of calculus.

Late assignments will not normally be accepted and there will be no resit for the mid-session test.

Assignments

Rationale: Assignments will give an opportunity for students to try their hand at more difficult problems requiring more than one line of argument and also introduce them to aspects of the subject which are not explicitly covered in lectures.

You will have to sign the University's anti-plagiarism declaration for each assignment, declaring that the assignment is your own work.

Assignments must be YOUR OWN WORK, or severe penalties will be incurred.

You should consult the University web page on plagiarism

`www.lc.unsw.edu.au/plagiarism`

Mid-Session Test

Rationale: The Mid-Session Test will give students feedback on their progress and mastery of the material.

There will be short answer questions in which correct answers are sought and there will be some longer questions requiring clear and logical presentation of correct solutions as well as some simple proofs and verbal explanations.

The test will be held in the first class of Week 8, i.e. Wednesday 7th May, 9 am.

You may bring your own non-programmable hand-held Scientific Calculator to the test. Calculators will not be provided for you.

Task	Date	Weighting	Duration	Material tested
Mid-session Test	Thursday 9 am Week 8	20%	50 mins	topics 1-4

If you are absent from the test, you must provide a medical certificate. In that case an M will be recorded and your final mark will be calculated from the other assessment tasks.

Examination

Duration: Two hours.

Rationale: The final examination will assess student mastery of the material covered in the lectures.

Weighting: 60% of your final mark.

Further details about the final examination will be available in class closer to the time.

Syllabus and Class Schedule

Week	Lecture Topic/Tutorial/Test	Hrs	Classes
1	Introduction & 1. Real Numbers	3	W1 C1 - W2 C1
2 - 3	2. Sequences	3	W2 C2 - W3 C2
4	Tutorial 1.	1	W4 C1
4 - 5	3. Functions and Continuity	2	W4 C2 - W5 C1
5	Good Friday		W5 C2 lost
5	Assignment 1 due end of Week 5 (Thursday 4 p.m.)		
6	Tutorial 2.	1	W6 C1
6 - 7	4. Differentiability	2	W6 C2 - W7 C1
7	Tutorial 3.	1	W7 C2
8	Mid-Session Test Preparation Tutorial	1	W8 C1
8	Mid-Session Test on topics 1 - 4	1	W8 C2
9 - 10	5. Integration	3	W9 C1 - W10 C1
10	Tutorial 4.	1	W10 C2
11 - 12	6. Series	3	W11 C1 - W12 C1
11	Assignment 2 due end of Week 11 (Friday 4 p.m.)		
12	Tutorial 5.	1	W12 C2

Additional resources and support

Tutorial Problems

A set of tutorial problems for each topic will be handed out at the start of each topic and will also be available from the My eLearning page for MATH3570. These problems are for YOU to do to enhance mastery of the course.

Students should attempt most of the problems BEFORE the tutorial when they will be considered.

SOME of the problems will be done in tutorials, but you will learn a lot more if you try to do them before the tutorial.

Textbooks

There is no set text for this course.

The content of the course will be defined by the lectures. Any book on elementary calculus (such as the standard first & second year text *Calculus: One and Several Variables* by Salas, Hille and Etgen) may prove useful. (This course is concerned only with one variable calculus).

For books more closely connected to the themes of this course, you may consult any of:

- *Calculus* by Michael Spivak (1st ed., Addison-Wesley/Benjamin, 1967; 2nd ed. Publish or Perish, 1980; 3rd ed. Cambridge Univ. Press, 2006)
- *Elementary Mathematical Analysis* by Colin Clark (2nd ed. Belmont, 1982), previously published as *The Theoretical Side of Calculus*.
- *Introduction to Analysis* by Edward D Gaughan, (5th ed., Brooks and Cole, 1998)
- *Principles of Mathematical Analysis* by Walter Rudin, (McGraw Hill, 3rd ed, 1976).
- *Elementary Classical Analysis* by Jerrold E. Marsden, (W.E. Freeman, 2nd ed. 1993).
- *Real Analysis* by Frank Morgan, (1st ed. American Mathematical Society, 2005).

Also there are many books related to some of the topics. The short books "Infinite series" by Knopp and Hyslop are classics.

All these are available in the UNSW library. Further suggestions may be mentioned in lectures.

The book by Spivak is a classic first university level calculus text with a chatty, readable style but is also quite rigorous on proofs and the foundations of calculus.

The book by Gaughan covers most of the material of this course and is closest to the aims of this course.

The books by Rudin and Marsden are a bit more advanced.

You will **not** have to buy any of these books but I would highly recommend Spivak's book, if not for now then for your future as a mathematics teacher.

Course Evaluation and Development

The School of Mathematics and Statistics evaluates each course each time it is run. We carefully consider the student responses and their implications for course development. It is common practice to discuss informally with students how the course and their mastery of it are progressing.

Administrative matters

Additional Assessment

The School of Mathematics policy on Additional Assessment is discussed in the document

"School of Mathematics, UNSW S1 2008, Important Information for Undergraduate Students"

which is attached to the back of this handout in the version distributed at the first lecture and can also be found at the web address mentioned in the next section.

Students with poor class attendance (i.e. below 70%) or sub-par pre-exam assessment of below 40% will **not** be granted normal additional assessment if they miss the final exam due to illness or misadventure or are ill at the final exam.
(See "Important Information for Undergraduate Students", Section 7 Additional Assessment Exams, subsection a))

School Rules and Regulations

Fuller details of the general rules regarding attendance, release of marks, special consideration etc are available via the School of Mathematics and Statistics Web page at

`http://www.maths.unsw.edu.au/students/current/policies/studentpolicy.html`.

Plagiarism and academic honesty

Plagiarism is the presentation of the thoughts or work of another as one's own. Issues you must be aware of regarding plagiarism and the university's policies on academic honesty and plagiarism can be found at

`http://www.lc.unsw.edu.au/plagiarism`
and
`http://www.lc.unsw.edu.au/plagiarism/plagiarism_STUDENTBOOK.pdf`.