



UNSW
SYDNEY

**Faculty of Science
School of Mathematics & Statistics**

**MATH3570
FOUNDATIONS OF CALCULUS**

Semester 1, 2017

MATH3570 – Course Outline

Information about the course

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

Consultation: Consultation hours will be announced in Week 1. Please use email if you wish to arrange an appointment outside my “definite” consultation hours.

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

Prerequisites: are at least 12 units of credit (UOC) 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, MATH5605, MATH5705

Classes: There will be two classes a week:

Monday	11 am – 12 noon	RC-2060	Weeks 1 – 12
Thursday	12 noon – 1 pm	RC-1043	Weeks 1 – 12

This semester, the schedule is not affected by public holidays.

There are no extra class times for tutorials. Instead 22 of the 24 class times will be normal classes (lectures or tutorials), and the remaining 2 class times will be for two tests.

The course will consist of **5 topics**:

1. Inequalities and Real Numbers (3 lects, 2 tuts)
2. Sequences (3 lects, 2 tuts)
3. Continuity (3 lects, 1 tut)
4. Differentiability (3 lects, 1 tut)
5. Integrability (3 lects, 1 tut)

Following the lectures for each topic there will be 1 or two tutorials based on problem sheets for that topic.

Attendance at all classes will be recorded. Overall class attendance will be considered for cases of Requests for Special Consideration.

Web site: The MATH3570 web pages at the **UNSW Moodle** 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.

Lecture outline notes will be made available lecture-by-lecture. Hopefully they will normally be available on Moodle ahead of time for you to print and bring to the lecture or if they appear late on Moodle they will be printed off and handed out at the lecture.

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. 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. **two** 30 minute tests (10% each) in weeks **6** and **12**;
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

- **Friday 4 p.m. of week 5 for Assignment 1;**
- **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 tests, marks will be awarded for correct working, logical setting out and appropriate explanations and 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.

Failure to hand in any assignment will count as zero for that assignment.

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.student.unsw.edu.au/what-plagiarism

Rationale: The two class tests will give students feedback on their progress and mastery of the material.

The details of the 30 minute class tests are:

Test 1 in Week 6 on topics 1 – 2

Test 2 in Week 12 on topics 3 – 5

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

As usual, if you miss a test, you must provide a medical certificate or similar documentation in order to gain a re-weighted assessment based on the exam and the other assessment tasks you have done.

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.

Some Past exam papers with solutions will be made available via the Moodle page.

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 **UNSW Moodle** web pages 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).

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 career 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

For information on Additional Assessment, see the document **Semester 1 2017 - Important Information for Undergraduate students** available on-line at the School of Mathematics and Statistics Web page at

Current Students > Undergraduate

> Help for Students > Information for all UG Students, Semester 1

Please read this document carefully!

In particular note the last section on **Concessional Additional Assessment**. Any student in **any mathematics courses** who receives a **preliminary final mark - which includes the exam mark** of **45 – 49** is automatically entitled to take the Additional Assessment exam and have a second chance at passing the course. The maximum final mark after Concessional Additional Assessment is 50.

It is up to **you** to then find out when and where the Additional Assessment exam is being held and attend this exam.

You will **not** be reminded of your entitlement to sit this exam nor when and where this exam is by mail or e-mail.

Information regarding time and location for the exam will be on the School's web pages near the end of the semester.

Please note the preliminary final mark includes the exam mark.

Even with 100% assessment in the four assessment tasks: Assignments 1 & 2 and the two class tests, this amounts to only 40% of the final mark, so **if you miss the final exam and if you do not put in a request for Special Consideration with a medical certificate for illness etc**, then you **do not** get Additional assessment and **you will fail the course!**

If you miss the final exam due to illness or your performance at the exam is affected by illness you have a very short time (at most 3 days! after the exam) to apply for Special Consideration at the UNSW Student Centre with medical certificates.

Of course, if Special Consideration is granted in these circumstances, you may sit the Additional Assessment exam and that exam will replace the final exam in the assessment formula, and you can earn any possible final mark.

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.student.unsw.edu.au/what-plagiarism>