MATH1131 Mathematics 1A

MATH1141 Higher Mathematics 1A

INFORMATION BOOKLET

Semester 1 2013

CONTENTS OF THE MATH1131/1141 COURSE PACK 2013

Your course pack should contain the following four items:

1. *Information Booklet*

   Information on administrative matters, lectures, tutorials, assessment, syllabuses, class tests, computing, special consideration and additional assessment
2. *Algebra Notes (for MATH1131/1141)*
3. *Calculus Notes (for MATH1131/1141)*
4. *Past Exam Papers Booklet*

Information booklet contents

GENERAL INFORMATION FOR MATH1131 and MATH1141

Background

MATH1131, Mathematics 1A, and MATH1141, Higher Mathematics 1A, are first year courses taught by the School of Mathematics and Statistics in semester 1, and are each worth six units of credit. MATH1131 is also taught in semester 2. Students who pass MATH1131 in semester 1 usually continue to study MATH1231, Mathematics 1B, in semester 2. Those students who pass MATH1141 with a Credit usually continue to study MATH1241, Higher Mathematics 1B, in semester 2. MATH1231 is also taught in Summer Session. MATH1131 and MATH1231 (or MATH1141 and MATH1241) are generally specified in Engineering programs, as well as many Science programs.

Students can only count one of MATH1131 and MATH1141 towards their degree. The excluded courses for MATH1131 are:

MATH1011, MATH1031, MATH1141, MATH1151, ECON1202 and ECON2291.

For the excluded courses for MATH1141 replace MATH1141 by MATH1131.

Assumed Knowledge

The assumed knowledge for MATH1131 is a mark of at least 100 on the NSW HSC Mathematics Extension 1 course. However, students with marks below 120 are advised that they will need work especially conscientiously. MATH1131 is also an appropriate course for those students who only attempted the NSW HSC 2 Unit Mathematics course (Calculus based) and who attained a mark of at least 90. Students who attained a mark below 80 in that course are likely to find MATH1131 very difficult. If you feel after two weeks of semester that MATH1131 is too demanding for you, then you should seek advice from the Student Services Office, RC-3090.
Students with a Mathematics Extension 2 combined mark above 176 or an Extension 1 combined mark above 145 are encouraged to enrol in MATH1141, which is the higher version of MATH1131.

Aims

The aim of MATH1131/1141 is that by the time you finish the course you should understand the concepts and techniques covered by the syllabus and have developed skills in applying those concepts and techniques to the solution of appropriate problems. Successful completion of this course, together with the second semester course MATH1231/1241, should mean that you will be well equipped both technically and psychologically to cope with the mathematics that you will meet in the later years of your program. It is also expected that students will be able to use the symbolic computing package Maple as an aid to solve problems that were generally inaccessible just a generation ago.

Learning Outcomes

A student should be able to:

- state definitions as specified in the syllabus,

- state and prove appropriate theorems,
- explain how a theorem relates to specific examples,
- apply the concepts and techniques of the syllabus to solve appropriate problems,
- prove specific and general results given specified assumptions,
- use mathematical and other terminology appropriately to communicate information and understanding,
- use the symbolic computing package Maple as an aid to solve appropriate problems.

Lecturers in charge

The course authority for MATH1131/1141 is the Director of First Year Studies, Peter Brown. He can be contacted via the Student Services Office, as detailed above. Other staff take responsibility for parts of the course as given below.
For the **Algebra** component:

Lecturer-in-charge Dr. T Britz Room 5111, Red Centre

For the **Calculus** component:

Lecturer-in-charge M. Pahor Room 3091, Red Centre

For the **Computing** component:

Lecturer-in-charge Dr J. Kress Room 4102, Red Centre

Lectures

Students in MATH1131 and MATH1141 are generally enrolled in a lecture group, where a lecture group consists of a sequence of two Algebra lectures and two Calculus lectures each week. There are four lecture groups in MATH1131 and two in MATH1141. Lectures commence in week 1 and run until week 12 as indicated in your timetable on myUNSW.

MATH1131

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures Group 1		9-10 Alg KBT Murray 10-11 Calc KBT Pahor	9-10 Calc KBT Pahor 10-11Alg KBT Murray		
Lectures Group 2				11-12 Alg Phys Th. Sukochev/Weston 12-1 Cal Phys Th. Coster	12-1 Calc Phys Th. Coster 1-2 Alg Phys Th. Sukochev/Weston
Lectures Group 3			12-1 Alg KBT Britz 1-2 Calc KBT Angell		3-4 Calc Mat A Angell 4-5 Alg Mat A Britz
Lectures Group 4		12-1 Alg Phys Th. Brown 1-2 Calc Phys Th. Pahor			9-10 Calc Phys Th. Pahor 10-11 Alg Phys Th. Brown

MATH1141

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures Group 1		9-10 Alg CLB 8 Doust 10-11 Cal CLB 8 Cowling	9-10 Cal CLB 8 Cowling 10-11 Alg CLB 8 Doust		
Lectures Group 2			12-1 Alg CLB 6 Potapov 1-2 Cal CLB 6 Schief		9-10 Cal CLB 8 Schief 10-11 Alg CLB 8 Potapov

It is important to note that:

- **If your timetable requires it, it is possible to take the algebra lectures from one group and the calculus lectures from another group**, but it is **not** possible to mix calculus lectures from two different groups or algebra lectures from two different groups (because the lecture groups do not keep exactly in step with each other).
- Important announcements and handouts may be given out in lectures, so missing lectures (or even arriving late) may cause significant difficulties for you.

Tutorials

Students in MATH1131 and MATH1141 are enrolled in two tutorials, one for algebra and one for calculus. The algebra tutorial is timetabled for the second half of the week, whilst the calculus tutorial is scheduled for the first half of the week. Students are able to change their tutorials, via myUNSW, until the end of week 1, and after that time, they can only change their tutorials with the agreement of the Student Services Office, RC-3090. To change a tutorial you will need to provide proof of a timetable clash or work commitments.

Note that

- **ALL tutorials commence in week 2 and run until week 13**;
- attendance at tutorials is compulsory and the roll will be called in tutorials;
- some tutorial classes may have to be amalgamated or created after the start of semester to maintain efficient tutorial sizes. If you are affected by any tutorial room changes you will be notified by an email to your official UNSW email account. During week 1 and 2 it is good practice to check your timetable regularly on myUNSW.

The main purpose of tutorials is to provide you with an opportunity to get help with any problems which you find difficult and any parts of the lectures or textbook which you don't understand. In order to get real benefit from tutorials you should

- Study your lecture notes and attempt relevant problems **before** the tutorial so that you can find out the areas in which you have difficulties.

- Make sure that your tutor is aware of the areas in which you need help.
- Be as specific as possible in describing your difficulties — don't just say "could you explain about differentiation".
- Be an active participant in tutorials, asking and answering questions rather than just sitting and watching.

All the tests and assignments which you submit (except formal examination scripts) will be marked by your tutor and returned through tutorials. In the rare event that your tutor has not arrived at your tutorial by 10 minutes past the hour a student in the tutorial class should contact the Student Services Office, by phone if the class is not in the Red Centre, so that a replacement tutor can be arranged.

Contacting the Student Services Office

The School of Mathematics and Statistics web-site

`http://www.maths.unsw.edu.au`

contains many pages of useful information on mathematics courses, school policies and how to obtain help, both academic and administrative.

In particular, the URL

`http://www.maths.unsw.edu.au/currentstudents/student-services`

provides a range of menus to choose from.

If you cannot find the answer to your queries on the web pages you are welcome to contact the Student Services Office directly.

The student administration officer for First Year in the Student Services Office of the School of Mathematics and Statistics is Ms F. Fan (Francy). All administrative enquiries concerning first year Mathematics courses should be sent to Ms Fan, either:

- by email to fy.MathsStats@unsw.edu.au
- by phone to 9385 7011
- or in person in room RC-3090

Change of tutorials due to timetable clashes or work commitments, permission to take class tests outside your scheduled tutorial, advice on course selection and other administrative matters are handled in the Student Services Office. Constructive comments on course improvment may also be emailed to the Student Services Office. Should we need to contact you, we will use your official UNSW email address of

zSTUDENTNO@student.unsw.edu.au

in the first instance.

UNSW Moodle

The School of Mathematics and Statistics uses the Learning Management System called Moodle. To log in to Moodle use your zID and zPass at the following URL:

`http://moodle.telt.unsw.edu.au`

Once logged in, you should see a link to MATH1131 or MATH1141 that will take you to the MATH1131 or MATH1141 homepage in Moodle.

If you are unable to log in to Moodle or can not access MATH1131 or MATH1141 once logged in you should contact the IT Service Centre. Contact information is provided on the Moodle login page.

Assessment

The final raw mark will be made up as follows:

Algebra and Calculus class tests	20%
Online Algebra and Calculus tests	4%
Online Computing test (Maple)	4%
Laboratory Computing test (Maple)	8%
End of semester exam	64%

Note that:

- You will **not** be allowed to take a calculator into class tests.
- Tutors are expected to enter class test marks into the School's database within a fortnight of the test being sat. These marks are then available to you through the Student Web Portal accessed via the "Maths & Stats marks" link on the home page of MATH1131 or MATH1141 on the UNSW Moodle server. It is **your responsibility** to check that these marks are correct and you should **keep marked tests until the end of semester** in case an error has been made in recording the marks. If there is an error, either speak to your tutor or bring your test paper to the Student Services Office as soon as possible but no later than Friday Week 13.
- Once the UNSW examinations section finalises the examination timetable, you will be able to find out the time and place of the MATH1131/1141 examination from myUNSW. The web page

  `https://my.unsw.edu.au/student/academiclife/assessment/examinations/examinations.html`

  has many useful links related to the running of UNSW examinations.
- Be aware that a **final mark of 49 often means that the course has been failed and has to be repeated.** Therefore, it is very important that you attempt all assessment tasks.
- If your final mark is in the range 46–49 then you may be awarded the grade of "Pass Conceded" (PC) provided your average mark for all your courses is sufficiently high. This decision is **not** made by the School of Mathematics and Statistics. The rules governing the granting of the grade of PC are on the web page

`https://my.unsw.edu.au/student/academiclife/assessment/concession_algorithm.html`

- **Medical certificates will generally not be accepted for missing the deadlines for the online tests**. See the section on "Computing Information" for more details.

Online Algebra and Calculus tests

Before the algebra and calculus tutorial class tests you must complete a simple online test that is designed to help you prepare for the tutorial tests. These tests are accessed via the web page

`https://mapleta.telt.unsw.edu.au`

where your "User login" is z followed by your UNSW student number and the "Password" is your zPass. The schedule for these online tests for MATH1131 is given below.

Test	**Available**	**Due**
TP1 - Math 1A Calculus online test 1	2pm Wednesday Week 3	4pm Friday Week 4
TP2 - Math 1A Algebra online test 1	2pm Monday MS Break	1pm Wednesday Week 6
TP3 - Math 1A Calculus online test 2	2pm Wednesday Week 7	4pm Friday Week 8
TP4 - Math 1A Algebra online test 2	2pm Monday Week 11	1pm Wednesday Week 12

The schedule for these online tests for MATH1141 is given below.

Test	**Available**	**Due**
TP1 - Math 1A Calculus online test 1	2pm Wednesday Week 3	4pm Wednesday week 4
TP2 - Math 1A Algebra online test 1	2pm Monday MS Break	4pm Monday week 6
TP3 - Math 1A Calculus online test 2	2pm Wednesday Week 7	4pm Wednesday Week 8
TP4 - Math 1A Algebra online test 2	2pm Monday Week 11	4pm Monday Week 12

The material covered by these tests is the same as for the tutorial algebra and calculus tests, as given on page 24 and 31.

Detailed information on how to use the online testing system is available from the MATH1131 course module on UNSW Moodle in the

MATH1131 Mathematics 1A Maple TA

folder. There is an analogous folder for MATH1141. In this section there is also a link, labelled "Link to Maple TA", to the web page where the tests are available. Despite the name "Maple" appearing in the link, these online tests are algebra and calculus tests and should **not** be confused with any other online test. To give you some familiarity with the online testing system a practice test will be available from week 1.

You will be allowed 5 attempts at each online algebra and calculus test but only your best mark for each test will count. Then, the best 3 of these 4 marks, one from each online test, will contribute up to 4% of your final grade.

Note:

- the first test becomes available on Wednesday of Week 3;
- each attempt at these tests must be your own work, but you are encouraged to discuss the methods required with other students;
- each version of a test will be slightly different, so don't just copy answers from one attempt to the next;
- only a limited numbers of users can have simultaneous access to Maple TA, so **do NOT** leave your attempts at these tests to the last day;
- **no additional attempts will be granted**. You have 5 attempts at these tests to allow for technical or other problems that may result in one or more attempts being lost;
- **no deadline extensions will be granted**. You should attempt these tests with sufficient remaining time to allow for unplanned service interuptions.

Class tests

Details of the dates and content of tests are given on pages 24 and 31 of this booklet. Sample copies of the tests are included in the Algebra and Calculus Notes.
Note that

- You **MUST** be enrolled in an Algebra tutorial and a Calculus tutorial and **YOU MUST TAKE EACH TEST IN THE TUTORIAL TO WHICH YOU HAVE BEEN OFFICIALLY ALLOCATED.**
- To each test you must bring
  - your **Student ID** card
  - some blank A4 writing paper
  - a **stapler** (so that you can staple a cover sheet to your answers).
- Normal exam conditions apply in tests. In particular, during the test you must not have visible any material relevant to the test and you must not try to get assistance from (or give assistance to) any other person.
- You will **not** be allowed to use a calculator in class tests.
- When your test answers have been marked and handed back to you by your tutor, don't try to change your answers or falsify the marks awarded — a student who tried to do this recently was penalised by being given a failure in the course.
- Your **best three scores** in the four tests will be counted towards your final assessment mark.

Interpretation of class test results

The average mark for tests in MATH1131 is between 6 and 7 out of 10. Past experience is that students are likely to have difficulty passing this course if their average test mark is less than 5. If you find that your average after the first two tests is less than 5, you should talk to your tutors about your situation and what you can do about it. Further, past records indicate that about 80% of students whose best three class tests totalled to 17 or less did not get an overall pass in MATH1131.

Computing tests

There will be two different forms of computing tests. An initial set of five small online tests will be run using Maple TA, followed by a laboratory based test in week 10. The online tests may be completed on any suitable web browser in your own time, but as the Maple package will be needed to answer the questions, the School computing labs are probably the best place to attempt the tests. These online Maple computing tests are linked to the self-paced Maple instruction modules in UNSW Moodle. Details on using Maple TA for online tests have been given on page 8. These online Maple computing tests will be available (almost) continuously, as they must be completed in sequence, but to gain marks for the computing component of the course the tests must be completed before the deadlines indicated below. You will have an unlimited number of attempts at these online **computing** tests, both before and after the deadlines in the following table. Note that it is only your best mark on each test that counts towards your final grade. Again, **do NOT** leave your attempts at these online tests until the last day. Inability to complete these online tests due to congestion in the school computing labs or in Maple TA on the last day will **NOT** be accepted as an excuse for missing the deadlines.

The deadlines for completion of the online Maple tests for MATH1131 are:

Tests	**Due to be completed by**
1, 2 and 3	4pm Friday of MS Break
4 and 5	4pm Friday of Week 7

The deadlines for completion of the online Maple tests for MATH1141 are:

Tests	**Due to be completed by**
1, 2 and 3	4pm Wednesday of MS Break
4 and 5	4pm Wednesday of Week 6

The additional Maple modules 6 and 7 are designed to assist you with preparation for the Maple laboratory test in week 10. There are online tests within Maple TA corresponding to modules 6 and 7, but these do not count towards your MATH1131/1141 assessment and are for self-testing purposes only.

The second form of computing test will be run under exam conditions in the School's laboratories. You must book for the test through the School's Student Web Portal, accessible via the "Maths & Stats marks" link on the course home page on UNSW Moodle, and you must bring your UNSW Student ID card to the test. Details of the laboratory test are given on page 36. There will also be a practice test available in Maple TA from no later than the start of week 6.

All computing tests are linked to the Algebra and Calculus material, so you should make sure you understand the course work before trying them.

Finally, the end of semester exam may contain one or two sub-questions requiring a knowledge of Maple.

SCHEDULE OF ALL CLASS ASSESSMENTS

Lectures run in weeks 1–12 and tutorials run weeks 2–13. The table below gives the schedule of class tests, online tutorial preparation tests and computing assessments.

Week	Algebra	Calculus	Computing
1			
2			
3			
4		TP1	
Mid-semester break			
5		Test 1	Online tests 1, 2 and 3 due
6	Test 1, TP2		
7			Online tests 4 and 5 due
8		TP3	
9		Test 2	
10			Test in Laboratory
11			
12	TP4,Test 2		
13			
End of semester examination — check UNSW exam timetables for details			

Advice to students

Students are advised to take particular note of the detailed syllabus and notes provided later in this document.

The level of depth of understanding required in this course is best understood by considering the exercises, the sample class tests and the past examination papers that are included in the MATH1131/1141 Course pack.

Computing and self-paced online Modules

In addition to the Calculus and Algebra components, there is a Computing component in MATH1131/1141. This is partly interwoven with the Calculus and Algebra components and partly independent of them. To assist in the self-directed learning of this component of the course, online self-paced learning modules are available in UNSW Moodle. These modules guide students through the computing component of this course and are integrated with, and enhance the lecture and tutorial content presented in Calculus and Algebra.

There will be introductory instructional videos, again available in UNSW Moodle.

Students are then expected to work through and complete the specified online modules as detailed on page 10. Associated with each module is a graded quiz and the completed quizes contribute 4% to the final grade. These modules are integrated with, and enhance the lecture and tutorial content presented in Calculus and Algebra. Learning content will be accessible at

all times for learning and revision, but the online assessments will only be available for credit until the published deadlines, given on page 10.

More information about the Computing component is given later in this booklet (see pages 10 and 32) and in the booklets *Computing Laboratories Information for Students* and *First Year Maple Notes 2013.*

These computing notes are freely available from the MATH1131/1141 module on UNSW Moodle, and also on the computers in the mathematics computing laboratories.

Computing consultants are available in laboratory RC-G012 from 12noon to 4pm every weekday during weeks 1 to 9.

Course Materials

The course materials for MATH1131/1141 are:

MATH1131/1141 *Course Pack 2013.*

Computing Laboratories Information for Students 2013;

First Year Maple Notes 2013.

S.L. Salas, E. Hille and G.J. Etgen, *Calculus - One and Several Variables*, any recent edition, Wiley.

The latest edition of the textbook, Salas, Hille and Etgen *Calculus - One and Several Variables*, 10th Edition comes packaged with access to the electronic resources known as WileyPlus. This electronic version provides internet access to the textbook, problems, worked solutions, tests (for self-assessment) and other electronic resources related to the text material. The purchase of the text from the UNSW Bookshop gives web access to the WileyPlus server for one year; it is possible to renew the web access on a yearly basis at a fee determined by the publisher. It is also possible to purchase just the web access to the electronic version of the textbook for one year. This can also be done at the UNSW Bookshop. Note that these WileyPlus electronic resources are provided by the publisher John Wiley, and **not** by the School of Mathematics and Statistics. Any difficulties that you might have with access to WileyPlus must be resolved directly with the publisher.

Salas, Hille & Etgen is sold at the UNSW Bookshop. Course Packs and computing notes are also sold through the UNSW Bookshop.

The Course Pack contains the following items:

- *Information Booklet that you are now reading;*
- *Algebra Notes (for MATH1131/1141);*
- *Calculus Notes (for MATH1131/1141);*
- *Past Exam Papers Booklet.*

Booklets contained in the Course Pack will **not** be available separately from the School of Mathematics and Statistics. However the information in this booklet and the algebra and calculus problems can be accessed through the web from the MATH1131 or MATH1141 modules on the UNSW Moodle server. Information on accessing the UNSW Moodle server is given above.

Getting help outside tutorials

If you are having difficulty understanding the lectures or doing the suggested problems, always try to get help through your tutorials. In most cases there will be other students who are

having the same difficulties and it is better to provide help to all at once rather than giving the same explanation to ten or twenty students individually outside class.

However, there may be occasions when there is not enough time to get your questions answered in a tutorial. In these cases you should be able to get some help outside tutorials. If your tutor is a full-time member of staff you can ask them for their room number and times when they are available to see students (many members of staff put a notice on their office door showing the times when they are available). Tutors who are not full-time members of staff are not required to be available outside tutorial class times and may not have offices in the School of Mathematics and Statistics. To cover students whose tutor is not available, from week 3 there is a roster which shows for each hour of the week a list of names of members of staff who are available at that time to help students in first year mathematics courses. This roster is displayed on the same noticeboard as timetables, near the School Office (Room 3070, Red Centre) and also outside the Student Services Office (Room 3090, Red Centre). It is also available from the web page

`http://www.maths.unsw.edu.au/currentstudents/consultation-mathematics-staff`

You can also avail yourself of the **Student Support Scheme**. This Scheme is financed by the School of Mathematics and Statistics and is staffed by later year mathematics students.

Student Support Scheme

The Student Support Scheme (SSS) is a drop-in consultation centre where students can come for free help with certain first- and second-year mathematics courses. It will only be open for two hours per day. The type of help offered by the tutors of the SSS is either one-on-one assistance, or, at busier times, assistance in small groups. Students typically bring their partial solutions of mathematics coursepack questions to the SSS office. An SSS tutor then provides guidance and advice. The SSS office is located in **RC-3064**. During semester the SSS schedule will be available on the SSS website at

`http://www.maths.unsw.edu.au/currentstudents/student-support-scheme`

by the end of Week 1. Please remember that there is no appointment needed. Just drop-in and you will be able to obtain one-on-one help from SSS tutors.

Problem sets

Problems for Algebra are included in the Algebra Notes and similarly, problems for Calculus are included in the Calculus Notes. These problem sets are also available in the algebra component and calculus component folders of the Course Materials folder for MATH1131/1141 in UNSW Moodle.

Remember that Mathematics, like tennis, can't be learnt just by watching someone else do it. **The key to success is to work through all the problem sets in your own time.** To get the most out of tutorials, you should attempt the relevant problems (as indicated in the problem schedules) **before** the tutorial so that you know which problems you find difficult.

Calculator Information

For end of semester UNSW exams students must supply their own calculator. Only calculators on the UNSW list of approved calculators may be used in the end of semester exams. This list is similar to the list of calculators approved for HSC examinations.

BEFORE the exam period calculators must be given a "UNSW approved" sticker, obtainable from the School of Mathematics and Statistics Office, and other student or Faculty centres. The UNSW list of calculators approved for use in end of semester exams is available at

`https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html`

Teaching Strategies

MATH1131 and MATH1141 are taught through carefully planned lectures that logically develop the concepts and techniques specified in the course. Examples are emphasised as they provide the underlying motivation for the course, and because students best understand the general theory when it is developed from simple, and then more complex, examples.

Small group tutorials allow students to apply the material introduced in the lectures. These tutorials provide the opportunity for individual assistance. Students are expected to work conscientiously at understanding the solutions to the exercises.

Self-paced online modules develop independent learning skills, introduce basic computing skills using a symbolic computing package and provide an opportunity to extend and enhance understanding of mathematical concepts by using computing power to enable attemps at more complex problems. Students are expected to work through the modules systematically in accordance with the published schedule. Consultants are available should assistance be required.

Students are encouraged to give constructive feedback to the teaching staff during the teaching semester. They are also encouraged to work collaboratively with other students in the course to develop their understanding and their problem solving skills.

Statement on Assessment

The School of Mathematics has responded to student and staff concerns about plagiarism. Consequently, all First Year Mathematics courses are assessed by randomly generated online tests, short class tests and a written examination. The online tests and short class tests provide regular feedback to students and allow the course to be broken into smaller segments to facilitate learning.

It is unusual for individual questions on class tests to be marked out of more than 3 or 4 marks, and advice is given to tutors as to how those marks are to be awarded. Generally part-marks are awarded according to the number of correct steps made in answering the question. Students should raise any concerns that they have regarding their marks with their tutor when their papers are returned. If their concerns are not satisfactorily resolved, they may speak to the First Year Director.

Detailed marking schemes are prepared for the marking of the end of semester examination and check marking is generally used for quality assurance. Marks will only be changed if the mark is inconsistent with the marking scheme.

At the end of the marking process a committee of staff determines the pass mark and produces the final marks.

Details regarding the tests and examination are given later in this document.

Graduate Attributes

This course will provide you with an in-depth knowledge of topics in Calculus and Linear Algebra, and show, through the lectures, how this mathematics can be applied in interdisciplinary contexts. Your skills in analytical critical thinking and problem solving will improve because

of the illustrative examples used in lectures and because of the problem based tutorial classes. These mathematical problem solving skills, which are based on logical arguments and specific techniques, are generic problem solving skills that can be applied in multidisciplinary work. The course will also engage you in independent and reflective learning through your independent mastery of tutorial problems and the Maple computing package. You will be encouraged to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Academic misconduct

It is very important that you understand the University's Rules for the conduct of Examinations and the penalties for Academic Misconduct. This information can be accessed through myUNSW at:

`https://my.unsw.edu.au/student/academiclife/assessment/examinations/examinations.html`.

In recent years there have been cases where severe penalties have been imposed for misconduct in relation to tests and exams in Mathematics courses.

Illness and other problems

If your performance in this course is affected by illness or other serious difficulties which are beyond your control, you can apply for Special Consideration and you may be offered the opportunity for Additional Assessment. See also the sub-section *Getting advice* on page 17.

In order to be offered Additional Assessment it is essential that you **follow exactly the procedures set out in the document entitled "Application for Special Consideration in First Year Mathematics Courses Semester 1 2013."** A copy of this document is included in this booklet on page 19. You should read it carefully now and keep it for reference at the time when you actually need it. Each year there are some students who fail a course because they didn't follow these instructions. Take particular note that

- The School will **NOT** contact you to tell you that you have been granted Additional Assessment. It is **YOUR RESPONSIBILITY** to find this out by following the instructions in the document mentioned above.

- **If you have a poor record of attendance or performance during the semester you may be failed regardless of illness or compassionate grounds affecting the final exam.**

Note also that

- If illness affects your attendance at or performance in a **class test**, do **not** make an application for Special Consideration. Simply show the original medical certificate to your tutor and also give a copy of the medical certificate to your tutor. This information will be taken into account when calculating your final assessment mark.

- Transport delays and oversleeping will **not** be accepted as reasons for missing class tests. (But note that only your best three test results are counted for assessment.)

- Because it is possible to sit the computing tests on many days, **except in very unusual circumstances, medical certificates will not be accepted as excuses for not sitting the computing test**. Therefore, it is recommended that you book to sit at an early time.
- Because online Maple TA tests are available for an extended period, **except in very unusual circumstances, medical certificates will not be accepted as excuses for not completing these tests**. Therefore, it is recommended that you complete these tests as early as possible.
- If you arrive too late to be admitted to the end of semester exam, go **immediately** to the Mathematics and Statistics Student Services Office, Room 3090, Red Centre.

Past examinations

Recent exam papers, with their solutions, are included in a separate booklet in the Course Pack.

Change of enrolment

You may feel, after some weeks of semester have passed, that you have not made the right choice between Higher Mathematics 1A, Mathematics 1A and Fundamentals of Mathematics B. If so, you should discuss the situation with your tutors or with me (Director of First Year Studies in Mathematics, Room 3073, Red Centre).

Changes between the three levels of first year Mathematics can be made without penalty up to the census date, which is the 31st March.

Information and handouts

Important announcements may be made in lectures. If you miss a lecture or tutorial, or arrive late for it, it is essential that you check whether you have missed any announcements or handouts. All important administrative announcements, especially those indicating a change to information contained in this booklet, are repeated as announcements on UNSW Moodle. Further, notices of an urgent nature may be emailed to students at their official UNSW email address.

School of Mathematics and Statistics Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the policies of the University. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Page on the MathsStats web site. Students in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the MathsStats web site starting at:

`http://www.maths.unsw.edu.au/currentstudents/assessment-policies`

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedures in it.

Course improvement

The School of Mathematics and Statistics has several mechanisms in place for regular review and improvement of First Year courses. One component of the review process is student feedback, generated either by the CATEI surveys or by direct contact from individual students or groups of students. Other elements of our course review processes include:

- feedback on program requirements from academics in other Schools and Faculties;
- regular rotation of lecturing staff teaching First Year courses to generate fresh and innovative approaches to the course content and structure;
- regular review of the quality of the tutors and tutorial problems.

A recent change, requested in several CATEI surveys, is the expansion of the previous "Outline calculus lecture notes" for MATH1131 and MATH1231 to a complete set of calculus notes, comparable to the well liked algebra lecture notes. Another recent change has been the introduction of short, online tests for Maple associated with the redesigned self-paced Maple learning modules. These changes were again in response to CATEI requests to provide more assistance with learning Maple. Even more recent has been the introduction of short, screen-capture videos to provide instruction on various aspects of the use of the computing facilities within the school. Further, a collection of short videos demonstrating solution techniques in key topic areas is being produced, again in response to requests for more online support in the course.

Getting advice

Your Algebra and Calculus tutors should be able to give you most of the advice you need on mathematical and administrative matters concerning MATH1131 or MATH1141. If they cannot help you, try your lecturers or one of the two Lecturers-in-charge (their names and room numbers are shown on page 3 of this booklet). If your problems are more serious, or haven't been resolved to your satisfaction, come to see me (Peter Brown) in Room 3073, Red Centre. I am happy to see you.

If you have general study problems or personal problems, don't just hope that they will go away — take advantage of the free and confidential help which is available within the university. The Learning Centre (currently on the lower ground floor of the north wing of the Chancellery Building) provides individual consultations and workshops on study skills, time management, stress management, English language, etc. The Counselling Service (2nd Floor, East Wing, Quadrangle Building) offers the opportunity to discuss any issue which concerns you including academic problems, personal relationships, administrative hassles, vocational uncertainty, sexual identity and financial hardship. For more details, see the Student Information web page, available from the home page of myUNSW.

Peter Brown
Director of First Year Studies
School of Mathematics and Statistics
fy.MathsStats@unsw.edu.au

ADDITIONAL INFORMATION FOR MATH1141 HIGHER MATHEMATICS 1A

This additional information applies only to students enrolled in *Higher* Mathematics 1A.

Content

Higher Mathematics 1A includes everything which is in MATH1131 Mathematics 1A and this accounts for 85% of the content of the Higher course. The remaining time is spent treating some of the common topics in greater depth and covering some extra topics. This booklet contains separate Calculus syllabuses for MATH1131 and MATH1141. For Algebra there is a syllabus for MATH1131 and a list of extra topics for MATH1141.

Assessment

All grades from High Distinction to Fail are awarded in both MATH1131 and MATH1141. **Marks in Higher Mathematics 1A will be scaled so that students in the Higher course are not at any disadvantage compared to students in the ordinary course MATH1131.**

The class tests and computing tests for MATH1141 are the same as those for MATH1131. However, the MATH1141 end of semester exam will contain questions that are quite different from those in the MATH1131 exam. There will be, at most, one complete question common to the MATH1131 exam and the MATH1141 exam.

APPLICATIONS FOR SPECIAL CONSIDERATION IN FIRST YEAR MATHEMATICS COURSES SEMESTER 1 2013

If you feel that your performance in, or attendance at, a final examination has been affected by illness or circumstances beyond your control, or if you missed the examination because of illness or other compelling reasons, you may apply for special consideration. Such an application **may** lead to the granting of additional assessment.

It is essential that you take note of the following rules, which apply to applications for special consideration in all first year Mathematics courses.

1. **Within 3 days** of the affected examination, or at least as soon as possible, you must **submit a request for special consideration to UNSW Student Central** ON-LINE.

   Please refer to link below for How to Apply for Special Consideration,

   `https://my.unsw.edu.au/student/atoz/SpecialConsideration.html#ApplyingforSpecialConsideration`

2. **Please do not expect an immediate response from the School.** All applications will be considered together. See the information below.

3. **You will NOT be granted additional assessment in a course if your performance in the course** (judged by attendance, class tests, assignments and examinations) **does not meet a minimal standard**. A total mark of at least 40% on all assessment not affected by a request for special consideration will normally be regarded as the minimal standard for award of additional assessment as will at least 80% attendance at tutorial classes.

4. It is **YOUR RESPONSIBILITY** to find out **FROM THE SCHOOL OF MATHEMATICS AND STATISTICS** whether you have been granted additional assessment and when and where the additional assessment examinations will be held. **Do NOT wait to receive official results from the university**, as these results are not normally available until after the Mathematics additional assessment exams have started. Information about award of additional assessment is available from the School of Mathematics and Statistics in the following ways:

   a) A **provisional** list of results in all Mathematics courses and of grants of additional assessment will be available via the "Maths&Stats marks" link in the UNSW Moodle module of your course. The date for this will be announced later.

   b) On **Friday 19th July ONLY**, you may telephone the School Office (9385 7111) to find out whether you have been granted additional assessment and where and when it will be held. **Note that examination results will not be given over the phone.**

5. The **timetables** for the additional assessment examinations will be available on the Mathematics website at the same time as the provisional list of results.

   The mid-year additional assessment examinations will be held on the days **Monday 22nd July to Tuesday 23rd July**.

6. If you have two additional assessment examinations scheduled for the same time, please consult the School of Mathematics and Statistics Office as soon as possible so that special arrangements can be made.

7. You will need to produce your UNSW Student Card to gain entry to additional assessment examinations.

IMPORTANT NOTES

- The additional assessment examination may be of a different form from the original examination and must be expected to be at least as difficult.
- If you believe that your application for special consideration has not been processed, you should immediately consult the Director of First Year Studies of the School of Mathematics and Statistics (Room 3073 Red Centre).
- If you believe that the above arrangements put you at a substantial disadvantage, you should, at the earliest possible time, send full documentation of the circumstances to the Director of First Year Studies, School of Mathematics and Statistics, University of New South Wales, Sydney, 2052.

In particular, if you suffer from a chronic or ongoing illness that has, or is likely to, put you at a serious disadvantage then you should contact the Student Equity and Disabilities Unit (SEADU) who provide confidential support and advice. Their web site is

`http://www.studentequity.unsw.edu.au`

SEADU may determine that your condition requires special arrangements for assessment tasks. Once the First Year Office has been notified of these we will make every effort to meet the arrangements specified by SEADU.

Additionally, if you have suffered a serious misadventure during semester then you should provide full documentation to the Director of First Year Studies as soon as possible. In these circumstances it may be possible to arrange discontinuation without failure or to make special examination arrangements.

Professor B. Henry
Head, School of Mathematics and Statistics

UNIVERSITY STATEMENT ON PLAGIARISM

Plagiarism is the presentation of the thoughts or work of another as one's own.[1] Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed[2].

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

[1] Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

[2] Adapted with kind permission from the University of Melbourne

ALGEBRA SYLLABUS AND LECTURE TIMETABLE

The algebra course for both MATH1131 and MATH1141 is based on the MATH1131/MATH1141 Algebra Notes that are included in the Course Pack.

The computer package Maple will be used in the algebra course. An introduction to Maple is included in the booklet *Computing Laboratories Information and First Year Maple Notes 2013*.

The lecture timetable is given below. Lecturers will try to follow this timetable, but some variations may be unavoidable, especially in MATH1141 classes and lecture groups affected by public holidays.

Chapter 1. Complex Numbers

Lecture 1. Development of number systems and closure. Definition of complex numbers and of complex number addition, subtraction and multiplication. (Sections 1.1, 1.2, start Section 1.3).
Lecture 2. Division, equality, real and imaginary parts, complex conjugates. (Finish 1.3, 1.4).
Lecture 3. Argand diagram, polar form, modulus, argument. (Sections 1.5, 1.6).
Lecture 4. De Moivre's Theorem and Euler's Formula. Arithmetic of polar forms. (Section 1.7, 1.7.1).
Lecture 5. Powers and roots of complex numbers. Binomial theorem and Pascal's triangle. (Sections 1.7.2, 1.7.3, start Section 1.8).
Lecture 6. Trigonometry and geometry. (Finish 1.8, 1.9).
Lecture 7. Complex polynomials. Fundamental theorem of algebra, factorization theorem, factorization of complex polynomials of form $z^n - z_0$, real linear and quadratic factors of real polynomials. (Section 1.10).

Chapter 2. Introduction to Vectors

Lecture 8. Vector quantities and $\mathbb{R}^n$. (Section 2.1, 2.2).
Lecture 9. $\mathbb{R}^2$ and analytic geometry. (Section 2.3).
Lecture 10. Points, line segments and lines. Parametric vector equations. Parallel lines.(Section 2.4).
Lecture 11. Planes. Linear combinations and the span of two vectors. Planes though the origin. Parametric vector equations for planes in $\mathbb{R}^n$. The linear equation form of a plane. (Section 2.5).

Chapter 3. Linear Equations and Matrices

Lecture 12. Introduction to systems of linear equations. Solution of 2×2 and 2×3 systems and geometrical interpretations. (Section 3.1).
Lecture 13. Matrix notation. Elementary row operations. (Sections 3.2, 3.3).
Lecture 14. Solving systems of equations via Gaussian elimination. (Section 3.4)
Lecture 15. Deducing solubility from row-echelon form. Solving systems with indeterminate right hand side. (Section 3.5, 3.6).
Lecture 16. General properties of solutions to $A\mathbf{x} = \mathbf{b}$. (Section 3.7). Applications. (Section 3.8) or Matrix operations (start Section 4.1)

Chapter 4. Matrices

Lecture 17. Operations on matrices. Transposes. (Sections 4.1, 4.2).
Lecture 18. Inverses and definition of determinants. (Section 4.3 and start Section 4.4).
Lecture 19. Properties of determinants. (Section 4.4).

Chapter 5. Vector Geometry

Lecture 20. Length, angles and dot product in $\mathbb{R}^2$, $\mathbb{R}^3$, $\mathbb{R}^n$. (Sections 5.1,5.2).
Lecture 21. Orthogonality and orthonormal basis, projection of one vector on another. Orthonormal basis vectors. Distance of a point to a line. (Section 5.3).
Lecture 22. Cross product: definition and arithmetic properties, geometric interpretation of cross product as perpendicular vector and area (Section 5.4).
Lecture 23. Scalar triple products, determinants and volumes (Section 5.5). Equations of planes in $\mathbb{R}^3$: the parametric vector form, linear equation (Cartesian) form and point-normal form of equations, the geometric interpretations of the forms and conversions from one form to another. Distance of a point to a plane in $\mathbb{R}^3$. (Section 5.6).

EXTRA ALGEBRA TOPICS FOR MATH1141

Extra topics for MATH1141 in semester 1 may be selected from the following:

Complex Numbers. Cardan's formula for roots of cubics, applications of complex numbers to vibrating systems.

Introduction to Vectors. Use of vectors to prove geometric theorems; parametric vector equations for rays, line segments, parallelograms, triangles; elements of vector calculus.

Linear Equations and Matrices. Elementary matrices and elementary row operations, applications of linear equations and matrices to electrical engineering (Kirchhoff's Laws), economics (Leontief model).

Vector Geometry. Use of vectors to prove geometric theorems, further applications of vectors to physics and engineering, rotations of Cartesian coordinate systems and orthogonal matrices.

ALGEBRA PROBLEM SETS

The Algebra problems are located at the end of each chapter of the Algebra Notes booklet. They are also available from the course module on the UNSW Moodle server. Some of the problems are very easy, some are less easy but still routine and some are quite hard. To help you decide which problems to try first, each problem is marked with an [R] or an [H]. The problems marked [R] form a basic set of problems which you should try first. Problems marked [H] are harder and can be left until you have done the problems marked [R]. You *do* need to make an attempt at the [H] problems because problems of this type will occur on tests and in the exam. If you have difficulty with the [H] problems, ask for help in your tutorial. The problems marked [**X**] are intended for students in MATH1141 – they relate to topics which are only covered in MATH1141. Extra problem sheets for MATH1141 may be issued in lectures.

There are a number of questions marked [**M**], indicating that Maple is required in the solution of the problem.

PROBLEM SCHEDULE

The main purpose of tutorials is to give you an opportunity to get help with problems which you have found difficult and with parts of the lectures or the Algebra Notes which you don't understand. In order to get real benefit from tutorials, it is essential that you try to do relevant problems *before* the tutorial, so that you can find out the areas where you need help. The following table lists the complete set of problems relevant to each tutorial and a suggested (minimal) set of homework problems for MATH1131 that you should complete **BEFORE** the tutorial. Your tutor will only cover these in class if you have already tried them and were unable to do them. You may also be asked to present solutions to these homework questions to the rest of the class. Students in MATH1141 should do the mininal set of homework questions and some of the [**H**] and [**X**] problems as well. Tutors may need to vary a little from this suggested problem schedule.

For tutorial	**Try to do up to**		**Homework**
in week	**chapter**	**problem**	**Questions**
1	No tutorial, but start learning how to use Maple and Maple TA		
2	1	17	1, 5, 8(c), 10, 12
3	1	26	18, 21(a)–21(d), 26
4	1	59	27, 28, 31, 33(a), 34(a), 40, 51, 54
5	1	82	60(a), 61, 68(b), 72
	2	14	1, 9(c), 9(e)
6	2	33 (Test 1)	17, 18, 21, 28,,31(c), 33(b)
7	2	50	34(b), 41(b), 41(d), 46, 47
8	3	12	5, 7, 10, 12(g), 12(h)
9	3	24	13(b), 14(c), 16(e), 17, 22(a), 24(a)
10	3	43	26, 27, 31, 40
	4	18	1, 7, 13, 15
11	4	53	19, 20, 23, 26, 32, 33, 36
12	5	16 (Test 2)	1, 6, 8, 9
13	5	37	17, 20, 28, 31(a), 31(c), 34(a), 35(b)

CLASS TESTS AND EXAMS

Questions for the class tests in MATH1131 and MATH1141 will be similar to the questions marked [**R**] and [**H**] in the problem sets. Since each class test is only twenty or twenty-five minutes in length only shorter straight forward tests of theory and practice will be set. As a guide, see the recent past class test papers (at the end of the Algebra notes).
The following table shows the week in which each test will be held and the topics covered.

		Topics covered	
Test	Week	**chapter**	**sections**
1	6	1	All
2	12	2	All
		3	All
		4	All

Examination questions are, by their nature, different from short test questions. They may test a greater depth of understanding. The questions will be longer, and sections of the course not covered in the class tests will be examined. As a guide, see the recent past exam papers in the separate past exam papers booklet.

CALCULUS SYLLABUS FOR MATH1131 MATHEMATICS 1A

The Calculus textbook is S.L. Salas & E. Hille and G.J. Etgen *Calculus - One and Several Variables,* any recent edition, Wiley. References to the 10th and 9th editions are shown as SH10 and SH9. To improve your understanding of definitions, theorems and proofs, the following book is recommended: *Introduction to Proofs in Mathematics*, J. Franklin & A. Daoud, Prentice-Hall.

In this syllabus the references to the textbook are *not* intended as a definition of what you will be expected to know. They are just a guide to finding relevant material. Some parts of the course are not covered in the textbook and some parts of the textbook (even in the sections mentioned in the references below) are not included in the course. The scope of the course is defined by the content of the lectures and problem sheets. The approximate lecture time for each section is given below. References to the 9th and 10th editions of Salas & Hille are shown as SH9 and SH10.

	SH10	**SH9**
1. **Sets, inequalities and functions.** (2.5 hours)		
$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$. Open and closed intervals. Inequalities.	1.2, 1.3	1.2, 1.3
Functions: sums, products, quotients composites. Polynomials, rational functions, trig functions as examples of continuous functions.		
Implicitly defined functions.	1.6-1.7	1.6-1.7
2. **Limits.** (2 hours)		
Informal definition of limit as $x \to a$ (a finite).	2.1, 2.2	2.1, 2.2
Formal definition of limit as $x \to \infty$.	pp177-178 pp195-198	pp222-224 pp243-246
Limit rules. The pinching theorem.	2.3, 2.5	2.3, 2.5
3. **Properties of continuous functions.** (1.5 hours)		
Combinations of continuous functions.	2.4	2.4
Intermediate value and min-max theorems.	2.6, B1, B2	2.6, B1, B2
Relative and absolute maxima and minima.	4.3-4.5	4.3-4.5
4. **Differentiable functions.** (2 hours)		
Definition of derivative via tangents.	3.1	3.1
Derivatives of sums, products, quotients and composites. Rates of change. Higher derivatives.	3.2-3.5	3.2-3.5
Derivatives of polynomial, rational and trig functions.	3.5,3.6	3.5,3.6
Implicit differentiation, fractional powers.	3.7	3.7
5. **The mean value theorem and applications**. (2 hours)		
Mean value theorem and applications.	4.1, 4.2	4.1, 4.2
L'Hôpital's rule.	11.5, 11.6,	10.5, 10.6

	SH10	SH9
6. **Inverse functions.** (1.5 hours)		
Domain, range, inverse functions,		
the inverse function theorem.	7.1, B3	7.1, B3
Inverse trig functions, their derivatives and graphs.	7.7	7.7
7. **Curve sketching.** (3 hours)		
Use of domain, range, intercepts, asymptotes,		
even or odd, calculus.	4.7, 4.8	4.7, 4.8
Parametrically defined curves.		
Relation between polar and Cartesian coordinates.	10.2	9.3
Sketching curves in polar coordinates.	10.3	9.4
8. **Integration.** (5 hours)		
Riemann sums, the definite integral and its		
algebraic properties.	5.1, B5	5.1, B5
Indefinite integrals, primitives and the		
two fundamental theorems of calculus.	5.2-5.5	5.2-5.5
Integration by substitution and by parts.	5.6, 8.2	5.6, 8.2
Integrals on unbounded domains, limit form of		
comparison test.	11.7	10.7
9. **Logarithms and exponentials.** (2 hours)		
ln as primitive of $1/x$, basic properties,		
logarithmic differentiation.	7.2, 7.3	7.2, 7.3
Exponential function as inverse of ln, basic properties.		
a^x, logs to other bases.	7.4-7.6	7.4-7.6
10. **Hyperbolic functions** (1.5 hours)		
Definitions, identities, derivatives, integrals		
and graphs.	7.8	7.8
Inverse hyperbolic functions.	7.9	7.9
Integrals involving hyperbolic or trig substitution.		
11. **Review.** (1 hour)		

CALCULUS SYLLABUS FOR MATH1141 HIGHER MATHEMATICS 1A

This is the syllabus for *Higher* Mathematics 1.
The Calculus textbook is S.L. Salas & E. Hille *Calculus - One and Several Variables,* any recent edition, Wiley. References to the 10th and 9th editions are shown as SH10 and SH9. For help with understanding the foundations of calculus you will find the following book readable and useful: *Calculus* by M. Spivak (there are multiple copies in the library). References to Spivak are in the column headed Sp.

In this syllabus the references to the textbook are *not* intended as a definition of what you will be expected to know. They are just a guide to finding relevant material. Some parts of the course are not covered in the textbook and some parts of the textbook (even in the sections mentioned in the references below) are not included in the course. The scope of the course is defined by the content of the lectures and problem sheets. The approximate lecture time for each section is given below.

	SH10	**SH9**	**Sp**
1. **Sets, inequalities and functions.** (2 hours)			
$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$. Open and closed intervals. Inequalities.	1.2, 1.3	1.2, 1.3	1, 2
Functions: sums, products, quotients, composites.			3, 4
Polynomials, rational functions, trig functions, as examples of continuous functions. Implicitly defined functions.	1.5-1.7	1.5-1.7	
2. **Limits.** (2.5 hours)			
Formal definition of limits as $x \to a$ (a finite) and as $x \to \infty$	2.1, 2.2 pp177-178 pp195-198	2.1, 2.2 pp222-224 pp243-245	5
Limit rules. The pinching theorem.	2.3, 2.5	2.3, 2.5	
3. **Properties of continuous functions.** (1.5 hours)			
Combinations of continuous functions.	2.4	2.4	
Intermediate value and min-max theorem.	2.6, B1, B2	2.6, B1, B2	
Relative and absolute maxima and minima.	4.3-4.5	4.3-4.5	
4. **Differentiable functions.** (1.5 hours)			
Definition of derivatives via tangents. Derivatives of sums, products, quotients and composites.	3.1	3.5	
Rates of change. Higher derivatives.	3.2-3.5	3.4, 3.7	
Derivatives of polynomial, rational and trig functions.	3.5, 3.6	3.6	
Implicit differentiation, fractional powers.	3.7	3.7	

	SH10	SH9	Sp
5. **The mean value theorem and applications.** (2 hours)			
Rolle and mean value theorems (with proof).			
Applications of the mean value theorem.	4.1, 4.2	4.1, 4.2	11
L'Hôpital's rule.	11.5, 11.6	10.5, 10.6	11
6. **Inverse functions.** (2 hours)			
Domain, range.			
Inverse functions, injective functions,	7.1, B3	7.1, B3	12
the inverse function theorem.			
Inverse trig functions, their derivatives and graphs.	7.7	7.7	
7. **Curve sketching.** (3 hour)			
Odd and even functions, periodicity, calculus.			
Use of domain, range, intercepts, asymptotes, periodicity,	4.7, 4.8	4.7, 4.8	
symmetry and calculus.			
Parametrically defined curves.			
Relation between polar and Cartesian coordinates.	10.2	9.3	
Sketching curves in polar coordinates.	10.3	9.4	
8. **Integration.** (5 hours)			
Riemann sums, the definite integral and its			
algebraic properties.	5.1, B5	5.1, B5	13
Indefinite integrals, primitives and the			
two fundamental theorems of calculus.	5.2-5.5	5.2-5.6	14
Integration by substitution and by parts.	5.6, 8.2	5.6, 8.2	18
Improper integrals, limit form of comparison test.	11.7	10.7	
9. **Logarithms and exponentials.** (2 hours)			
ln as primitive of $1/x$, basic properties,			
logarithmic differentiation.	7.2, 7.3	7.2-7.6	
Exponential function as the inverse of ln			
basic properties.			
a^x, logs to other bases.	7.4-7.6		
10. **Hyperbolic functions** (1.5 hours)			
Definitions, identities, derivatives, integrals			
and graphs.	7.8	7.9, 7.10	
Inverse hyperbolic functions.	7.9	7.9	
11. **Review.** (1 hour)			

PROBLEM SETS

The Calculus problems are located at the end of each chapter of the Calculus Notes booklet. They are also available from the course module on the UNSW Blackboard server. Some of the problems are very easy, some are less easy but still routine and some are quite hard. To help you decide which problems to try first, each problem is marked with an [**R**], an [**H**] or an [**X**]. The problems marked [**R**] form a basic set of problems which you should try first. Problems marked [**H**] are harder and can be left until you have done the problems marked [**R**]. You *do* need to make an attempt at the [**H**] problems because problems of this type will occur on tests and in the exam. If you have difficulty with the [**H**] problems, ask for help in your tutorial. The problems marked [**X**] are intended for students in MATH1141 – they relate to topics which are only covered in MATH1141. Extra problem sheets for MATH1141 may be issued in lectures. Remember that working through a wide range of problems is the key to success in mathematics.

PROBLEM SCHEDULE

The main reason for having tutorials is to give you a chance to get help with problems which you find difficult and with parts of the lectures or textbook which you don't understand. To get real benefit from tutorials, you need to try the relevant problems *before* the tutorial so that you can find out the areas in which you need help. The following table lists the complete set of problems relevant to each tutorial and a suggested (minimal) set of homework problems for MATH1131 that you should complete **BEFORE** the tutorial. Your tutor will only cover these in class if you have already tried them and were unable to do them. You may also be asked to present solutions to these homework questions to the rest of the class. Students in MATH1141 should do the minimal set of homework questions and some of the [**H**] and [**X**] problems as well. Tutors may need to vary a little from this suggested problem schedule.

Week	**Calculus problems**		**Homework**
	Chapter	Problems up to	**Problems**
1	No tutorial, but do the Revision problems and go to the introduction to computing lecture at the time corresponding to your calculus tutorial		
2	1	19	4(e), 5(d), 10(h), 12, 13(e), 15, 17
3	2	15	1(e), 2(b), 3(b), 5, 12(b), 13(a)
4	3	10	3, 6, 9(a), 9(c), 10(a), 10(b)
5	4	17	2(d), 8(d), 9(b), 12(a), 17
6	5	15	1(b), 3, 4(b), 7(a), 10(b)
7	5	27	16, 19, 20(c), 21(d), 26
	6	7	1, 5
8	6	17	8(b), 8(d), 8(f), 11(b)
	7	6	2(b), 5(b)
9	7	19	7(c), 8(b), 13(c), 15(a), 16(c)
10	8	17	4(a), 13(a), 13(b), 15(d), 16(d)
11	8	29	18(b), 18(e), 19(c), 19(d), 22(a), 22(b), 24(b)
12	9	11	2(a), 3(b), 4(e), 5(a), 8(c), 9(e), 9(h)
13	10	13	2(b), 3(a), 7(c), 8, 10(b), 12(a)

CLASS TESTS AND EXAMS

The tests will take place in tutorials in the following weeks:

Test 1 Week 5.

Test 2 Week 9.

Test 1 may include revision of some topics from the Extension 1, or 3 Unit Mathematics, syllabus of the NSW HSC examination. These questions will be a similar level of difficulty to the questions in the Revision Questions section of the Calculus Notes booklet.

Test 1 and Test 2 will cover sections of the syllabus as shown in the table below. The test questions will be similar to the questions marked [R] and [H] in the Calculus Problems booklet. The table shows which problems are relevant to each test.

Test	Syllabus sections	[R] and [H] problems in
1	1, 2 and 3	Chapters 1–3
2	4, 5 and 6	Chapters 4–6

It is important to note that:

- The class tests do not cover the whole syllabus.
- Questions in the exams may be very different from those in the class tests.

Examples of class tests are contained in the Algebra Notes booklet and the Calculus Notes booklet.

TP1, TP2, etc denote the weeks when the online tutorial preparation tests are due for completion. The precise availability of these tests is given on page 8 and also in Maple TA. Similarly, the precise deadlines for the online computing tests are given on page 10 and again in Maple TA.

COMPUTING INFORMATION

Background

The University of New South Wales has a policy that all its students should be introduced to the basics of computer use during their course. For students in Business, Biological and Physical Sciences and Engineering, part of that requirement is met by the Computing component of First Year Mathematics. Most of you will also need to use computers in other courses within your program.
Students in first year mathematics courses are introduced to the symbolic computing package known as Maple which is now a well established tool that continues to influence the application of mathematics in the real world, as well as how mathematics is taught. Learning to use Maple will enhance your understanding of the mathematics involved in the algebra and calculus sections of this course. Maple also enables you to tackle larger, harder and more realistic mathematical problems as it can handle all the difficult or tedious algebraic manipulations present in the problems. Furthermore, learning some Maple introduces you to some of the basic ideas and structures in computer programming. You will find the skills you acquire and the techniques you learn useful in many other courses you study, both within and outside the School of Mathematics and Statistics.

All Mathematics and Statistics majors should consider doing further computing courses, such as MATH2301 Mathematical Computing, in their degree program.

Computing lab

The main computing laboratory is Room G012 of the Red Centre. You can get to this lab by entering the building through the main entrance to the School of Mathematics and Statistics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, on the mezzanine level of the Red Centre. The laboratories will normally be open as follows:

		M020	**G012**
During semester:	Monday to Friday	9 am to 9 pm	9 am to 9 pm
Week 10:	Monday and Friday	9 am to 9 pm	**Closed**
	Saturdays, Sundays	Closed	Closed
Outside Session Times:	Monday to Friday	9 am to 9 pm	Closed
Public holidays and Weekends		Closed	Closed.

Any changes to these times will be posted on the door of Room M020.

Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing tests on time.

Remote Access

Two virtual Linux lab machines called sigma and sigma2 (`sigma.maths.unsw.edu.au` and `sigma.maths.unsw.edu.au`) are available for remote access from your own laptop or home computer. Sigma and sigma2 have exactly the same software available as one of the Red-Centre linux lab computers (e.g. Maple, MATLAB, etc.). To use this service you will need to download and install the NX client which is freely available for Windows, Mac and Linux. Information

on how to download and install this software and use it to connect to sigma is available on UNSW Moodle in the Computing Component folder of MATH1131/1141 Alternatively, if you know how, you can use ssh to access sigma.

Please note that because this is a remote service that can be used by many students, you may find that sigma is slow to respond or is unavailable, particularly at times of high demand. Hence you are advised not to rely on sigma at critical times such as close to test deadlines. Using an actual computer in the lab or software, such as Maple, installed on your own computer will usually be more reliable.

How to start

The MATH1131/1141 module in UNSW Moodle has several short instructional videos illustrating how to access and use all the computing related components of MATH1131/1141. The general introductory videos are located in the Course Materials folder, with videos related to Maple located in the Computing component folder and those related to Maple TA in the Online Assessment in Algebra, Calculus and Computing folder.

Following this you should use some of your free time in week 1 go to the Red Centre lab G012 and complete the Maple introductory module and in Maple TA you should complete the assignment "Using Maple TA". Consultants will be on duty from 12noon to 4pm each day to help you get started with these tasks.

For the computers in the school laboratories, your login ID is "z" followed immediately by your seven digit student number and your password is your zPass, issued to you at enrolment. If you have difficulties logging in, the computers will allow a five minute login with ID "newuser" and password "newuser" where you can access `https://idm.unsw.edu.au` and reset or unlock your zPass. Be aware that two consecutive failed login attempts will lock you out of the computing system for 30 minutes, or until you reset or unlock your zPass.

From week 1 onwards, you are expected to master Chapter 1 and sections 2.1 to 2.11 in the First Year Maple Notes 2013 by completing the self-contained Maple learning modules and by obtaining help, if necessary, from the Consultants who will be available in Room G012 from 12noon to 4pm each weekday of weeks 1 to 9.

Computing syllabus

The Maple computing component is taught via a series of self-paced modules located in UNSW Moodle You are expected to work steadily through these modules, completing the quiz at the end of each module before moving on to the next module. The timetable for the completion of these small tests is explained in detail in the section on Computing tests on page 10 and is clearly visible in Maple TA.

The online teaching package consists of the following modules:

Module 0 Getting Started: starting Maple, the Maple worksheet, new user tour, common mistakes.

Module 1 The Basics: arithmetic operations, brackets, constants and variables.

Module 2 Functions: expressions vs functions, Maple's functions, substituing in an expression, piecewise defined functions, simplifying an expression.

Module 3 Basic Calculus: limits, differentiation, maxima and minima, integration.

Module 4 Collections of Expressions: Maple sequences, sets and lists, sums and products, manipulating Maple structures.

Module 5 Complex Numbers and Equations: complex numbers, equations, exact and approximate solutions.

Module 6 Plotting: plotting functions of one variable, parametric plots, polar plots, implicit plots, data plots.

Module 7 Linear Algebra: creating and manipulating vectors and matrices, vector and matrix operations, Gaussian elimination.

Using other computers

Maple is available for Windows, Mac and Linux and your own copy of Maple may well be of great use to you throughout your studies at university. However, it is not necessary for you to buy Maple at any stage to complete any of your mathematics courses at UNSW. You are permitted to do the online Maple test from home or anywhere else that you have access to Maple TA and Maple. However the School is not able to provide technical help with external equipment and cannot be responsible for the reliability of your network connection and computer.

WARNINGS

Misuse of university IT systems is treated as Academic Misconduct and is a serious offence. Guidelines for acceptable conduct are in the *Computing Laboratories Information for Students 2013* booklet.

The Mathematics Computer Labs will be heavily used this year as there are about 4000 students with accounts. Queues will develop at peak times such as when assignments or tests are due. Plan what you are going to do on the computer BEFORE you sit down at a computer — don't waste your time and other people's. Problems with your own (home) computer, internet service or the UNSW IT systems are not considered to be an excuse for missing tests or test deadlines. So you should PLAN AHEAD and not leave things until the last minute.

You should not use Maple to do your Algebra and Calculus tutorial problems (unless it is explicitly indicated) until you have understood the material thoroughly, as working through the problems is important for learning the material. Once the material is understood you can then use Maple to check your answers. You may also use Maple for other courses.

It is academic misconduct to do other people's tests or to allow others to do your test.

Assessment

There will be two different forms of computing tests. The details of the online Maple tests have been described previously in the section on Computing tests on page 10.

The second form of computing test will be run under exam conditions in the School's computing laboratories during week 10. You must book for the test through the School's Student Web Portal, accessible via the "Maths & Stats marks" link in the course menu of MATH1131/1141 on UNSW Moodle, and bring your UNSW Student ID card to the test.
All tests are linked to the Algebra and Calculus material, so you should make sure you understand the course work before trying them.

Finally, the end of semester exam may contain one or two sub-questions requiring a knowledge of Maple.

Special consideration for the laboratory test

Because the computing tests can be sat at many different times, medical, or other, reasons for missing the test will generally not be accepted. For this reason you are advised to choose an early time to sit the test. If you consider that you have an exceptional reason for missing the test then you must speak to Dr Kress, Lecturer in Charge of First Year Computing as soon as possible after the tests have been completed. Note that a medical or similar resit may be denied if there is insufficient evidence of preparation for the missed test. Tutors do not have permission to accept medical certificates for the computing test.

If possible, special arrangements for the computing laboratory test will be made for students with supporting documentation from SEADU. If you wish to exercise this option, you must contact Dr Kress before the laboratory tests have commenced so that any needed special facilities can be implemented.

Dr Jonathan Kress (Room: Red Centre 4102)
Lecturer in Charge
First Year Computing

Details of the computer laboratory Maple test follow in the next pages.

MATH1131/1141 LABORATORY TEST

Tests will be held in the Red Centre computer lab G012 at various times during Week 10. You must make a booking to do the test at one of these times. Bookings must be made through Moodle. This booking facility should be available during week 8 of semester. When you have logged on, follow the appropriate link to get instructions about how to make a booking. If you believe that all the proposed times will be impossible for you, inform the Student Services Office immediately.

The test will be on the features of Maple which are covered in Chapter 1 and sections 2.1 to 2.11 of the First Year Maple Notes 2013.

You will NOT need to remember the exact syntax of each command because you will be provided with a hard copy of the First Year Maple Notes in the test and you will also have access to an online copy of the Notes, the online help within Maple itself and the online self-paced lessons from Moodle. However, you WILL need to practise for the test by working through the practice problems provided on Maple TA. Don't just sit at home and work out commands which you think will work. It is essential that you try out your answers on the computer to check that they do work and to get practice at recognising and recovering from common mistakes such as omitting the colon in `:=` or forgetting to unassign a variable.

For each of the practice problems, Maple TA will show you the correct answer, but not the commands which you might use to get that answer. If you have difficulty doing one of these problems, ask for help from one of the computing consultants in the labs. **If your Maple worksheet crashes while you are working on the practice problems, please make a note of what you were doing at the time and inform one of the computing consultants.**

A sample laboratory test will be made available in Maple TA by the start of week 6. Try to do it in 35 minutes AFTER you have worked through all the practice problems. More details on this laboratory test will be made available during the semester and posted on UNSW Moodle.

You will NOT be allowed to take any calculators or writing materials (pens, pencils, paper) into the test.

STUDENT-OWNED COMPUTERS FOR MATHEMATICS COURSES

The School of Mathematics and Statistics is committed to providing, through its own laboratories, all the computing facilities which students need for courses taught by the School. No student should feel the need to buy their own computer in order to undertake any Mathematics course. Nevertheless, the following information is provided for the benefit of those who may wish to use their own computer for work associated with Mathematics courses.

All of our courses have a UNSW Moodle presence, and it is there you should look for course materials or links unless your lecturer tells you otherwise. UNSW Moodle may be accessed from any computer with internet access; see their help files and pages for technical requirements and how to check whether your web browser is supported.

The School of Mathematics and Statistics provides assistance to students using teaching software in its laboratories. It does not have the resources to advise or assist students in the use of home computers or in communication between home computers and university facilities.

SOME GREEK CHARACTERS

Listed below are the Greek characters most commonly used in mathematics.

Name	Lower case	Upper case	**Name**	Lower case	Upper case
Alpha	α		Nu	ν	
Beta	β		Xi	ξ	
Gamma	γ	Γ	Pi	π	Π
Delta	δ	Δ	Rho	ρ	
Epsilon	ϵ		Sigma	σ	Σ
Zeta	ζ		Tau	τ	
Eta	η		Phi	φ or ϕ	Φ
Theta	θ	Θ	Chi	χ	
Kappa	κ		Psi	ψ	Ψ
Lambda	λ	Λ	Omega	ω	Ω
Mu	μ				