Course Outline

MATH1131 Mathematics 1A

MATH1141 Higher Mathematics 1A

School of Mathematics and Statistics

Faculty of Science

Term 3, 2019

Contents

1. Staff

MATH1131 Mathematics 1A and MATH141 Higher Mathematics 1A

Lecturer-in-charge	Name	Email	Room
Course Authority	Assoc. Prof. Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Maple computing	Dr Chi Mak	chi.mak@unsw.edu.au	RC-4073
Algebra online tutorials	Dr Joshua Capel	j.capel@unsw.edu.au	RC-5107
Calculus online tutorials	Dr Daniel Mansfield	daniel.mansfield@unsw.edu.au	RC-4070

MATH1131 Mathematics 1A

Lecture Group	Lecturer Name	Email	Room
Lecture A Algebra Calculus	Assoc. Prof. Chris Tisdell Dr Lee Zhao	cct@unsw.edu.au l.zhao@unsw.edu.au	RC-4079 RC-4106
Lecture B Algebra Calculus	Assoc. Prof. Chris Tisdell Mr David Crocker	cct@unsw.edu.au d.crocker@unsw.edu.au	RC-4079 RC-3092

MATH141 Higher Mathematics 1A

Lecture Group	Lecturer Name	Email	Room
Lecture A Algebra Calculus	Dr Alina Ostafe Professor Wolfgang Schief	alina.ostafe@unsw.edu.au w.schief@unsw.edu.au	RC-4078 RC-4069

Staff consultation times will be posted on Moodle and on the School of Mathematics and Statistics website on the *Current Students* > *Undergraduate* > *Student Services* > *Help for Students* page by the beginning of week 2 each term.

2. Administrative matters

Contacting the Student Services Office

Please visit the School of Mathematics and Statistics web-site for a wide range of information on School Policies, Forms and Help for Students by visiting the "**Student Services"** page.

For information on Courses, please go to "Current Student", "Undergraduate and/or Postgraduate", "**Courses Homepage**" for information on all **course offerings.**

The "Student Notice Board" can be located by going to the "Current Students" page; Notices are posted regularly for your information here. Please familiarise yourself with the information found in these locations. The School web page is: https://www.maths.unsw.edu.au

If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly. The First Year Advisor in the Student Services Officer is Mrs Markie Lugton. All administrative enquiries concerning first year Mathematics courses should be sent to Markie Lugton, either:

- By email to ug.mathsstats@unsw.edu.au
- By phone: 9385 7011
- Or in person to the Red Centre building, level 3, room 3072

Change of tutorials, due to timetable clashes or work commitments, advice on course selection and other administrative matters are handled in the Student Services Office. Constructive comments on course improvement may also be emailed to the Director of First Year Mathematics, A/Prof Jonathan Kress. Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please state your student number in all emails to the Student Services Office.**

3. Course information

Units of credit: 6

Exclusions for MATH1131: MATH1011, MATH1031, MATH1141, MATH1151, ECON1202, ECON2291

Exclusions for MATH1141: MATH1011, MATH1031, MATH1131, MATH1151, ECON1202, ECON2291

Teaching times and locations: see the link on the central timetable web pages:

Timetable for MATH1131: http://timetable.unsw.edu.au/2019/MATH1131.html
Offered in: Terms 1, 2 and 3

Timetable for MATH1141: http://timetable.unsw.edu.au/2019/MATH1141.html
Offered in: Terms 1 and 3

Course summary

This course will provide you with a good working knowledge of Calculus and Linear Algebra, and show how these topics can be applied in interdisciplinary contexts. Analytical thinking and problem solving are demonstrated in lecturers, and you will have an opportunity to develop your own analytical thinking and problem-solving skills in classroom and online tutorial classes. This course enhances your ability to solve problems using logical arguments and techniques, which are generic skills that can be applied in multidisciplinary work. The course will also engage you in independent and reflective learning through your tutorial problems and the Maple computing package. You are encouraged to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Course 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. You should be able to use technology to aid your mathematical problem solving and communication of mathematical ideas. Successful completion of this course, together with the courses MATH1231/1241 will enable you to understand the mathematics that you will meet in the later years of your program.

Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

- State definitions and theorems in the syllabus and apply them to specific examples,
- Apply the concepts and techniques of the syllabus to solve appropriate problems,
- Use technology as an aid to solve appropriate problems and communicate mathematical ideas.
- Communicate mathematical ideas effectively using correct terminology.
- Apply ideas in the syllabus to unfamiliar contexts,
- Recognise and create valid mathematical arguments.

In MATH1141 there will be greater emphasis on CLOs 5 and 6 than in MATH1131.

4. Learning and teaching activities

Lecturers & Tutorial Schedule

Lectures and tutorials run in all weeks from 1 to 10 unless noted otherwise below.

MATH1131 Mathematics 1A

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures Group A	11am to 1pm (Week 1-3, 5-11) **Burrows Th.**			12pm to 2pm (Week 1-5, 7-10) **Burrows Th.**	12pm (Week 1 -10) **Burrows Th.**
Lectures Group B		9am to 11am (Week 1-10) **Burrows Th.**	11am to 1pm (Week 1-5, 7-10) **Mathews Th.A**	11am to 12pm (Week 1-10) **CLB-7**	
MATH1131 Tutorials	M13: 1pm-2pm	T11: 11am-12pm T17: 5pm-6pm	W14:2pm-3pm W16: 4pm – 5pm		F13: 1pm-2pm
MATH1131 Other	**Other classes are only for lab tests**, held in the Red Centre lab RC-M020 in weeks 5 & 9. Refer to your online timetable for day and time details. MATH1131: http://timetable.unsw.edu.au/2019/MATH1131.html#S3S				

MATH1141 Higher Mathematics 1A

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures	11am to 1pm (Week 1-3, 5-11) **Rex Vowels**			12pm to 2pm (Week 1-5, 7-10) **Rex Vowels**	12pm-1pm (Week 1 -10) **Rex Vowels**
MATH1141 Tutorials	M13: 1pm-2pm	T11: 11am-12pm			F13: 1pm-2pm
Other	**Other classes are only for lab tests**, held in the Red Centre lab RC-M020 in weeks 4 & 8. Refer to your online timetable for day and time details. MATH1141: http://timetable.unsw.edu.au/2019/MATH1141.html#S3S				

Classroom Tutorials

Students in MATH1131 and MATH1141 are enrolled in one weekly classroom tutorial. The classroom tutorial will offer both Algebra and Calculus tutorials in alternatively weeks with calculus in odd weeks and algebra in even weeks. **Attendance is compulsory for all classroom tutorials** and a roll will be called at all tutorial classes.

Students can change their tutorial via myUNSW until the end of week 1. After that time, they can only change

tutorials by going to the Student Services Office, Red Centre Building room RC-3072 with evidence of a timetable clash or work commitments. NB: Classroom tutorials commence in week 1 and run until week 10.

The time and location of your Classroom Tutorial can be found on myUNSW. The main reason for having Classroom Tutorials is to give you a chance to tackle and discuss problems which you find difficult or don't fully understand, so it is important to try at least a selection of tutorial problems before attending your class so that you know the questions you would like to ask of your tutor. A schedule of suggested homework problems, to be attempted before your classroom tutorial, will be posted on Moodle. Classroom tutorials will cover Calculus in odd weeks and Algebra in even weeks.

Solving problems and writing mathematics clearly are two separate skills that need to be developed through practice. We recommend that you keep a workbook to practice *writing* solutions to mathematical problems.

If your tutorial falls on a public holiday, it will be cancelled for that week. You can optionally attend another tutorial class for that week only. You can find the times and locations of tutorials on the central timetable.

Online Tutorials

Weekly

There is a weekly online tutorial due at 1pm on Monday of the following week. The first deadline is on Monday of week 2. Each online tutorial will consist of 6 topics. One topic will consist of a short video or self-paced lesson and some corresponding exercises on Maple TA. There will be 26 algebra topics, 26 calculus topics and 8 Maple coding topics.

The online tutorials are an integral part of this course. They will help you stay up-to-date with the course content and will give you an alternative view on the course materials. Your best grade from 8 of the 10 online tutorials will be counted towards your final grade. See the "Online Tutorial Lab Test" section for more details.

Note:

- Your work on this must be your own work, but you are encouraged to discuss the methods required with other students.
- Each version of an online tutorial will be slightly different.
- Only a limited number of users can have simultaneous access to Maple TA, so **do NOT** leave your work on these to the last day when the server may be busy.
- **No deadline extensions will be granted.** You should attempt these tests with sufficient remaining time to allow for unplanned services interruptions.

Lab Tests

As well as completing the weekly online component of the Online Tutorials, you will take two supervised tests based on the same set of questions. These tests will be conducted in a Red-Centre lab in weeks 4 to 5 for the first test and weeks 8 to 9 for the second test. Lab tests are scheduled in your timetable either for weeks 5 & 9 for Math1131 and weeks 4 & 8 for Math1141.

Moodle

Log in to Moodle to find announcements, general information, notes, lecture slide, classroom tutorial and homework problems and links to online tutorials and assessments.

https://moodle.telt.unsw.edu.au

Maple TA

Online tutorials and online assessments in this course use a system called Maple TA. Information on how to access and use Maple TA is provided on Moodle. **Note that "Maple" and "Maple TA" are different.** Maple is the computer algebra software that you will learn how to use in the Maple coding part of this course, and Maple TA is an online assessment system used in this course for the online tutorials and online assessments.

5. Assessment

Overview

The assessment structure of MATH1131 and MATH1141 may be quite different to high school and other courses that you are used to. It is designed so that students should expect to be close to passing the course before taking the final exam with pre-exam assessment focusing on basic skills and the exam focusing on more advanced skills.

- The Online Tutorials allow answers to be checked while working on them, they are available for an extended period and students can work together, seek help and use any resources they wish. Most students gain a perfect score in these.
- The Lab Tests allow unlimited practice of questions from the actual question bank before the test. A passing student should be aiming to score at least 80% in these.
- The Assignment is available over an extended period and students can work on this with the benefit of all the course resources. A passing student should expect a mark of at least 6 or 7 out of 10 for the Assignment.
- The average mark for pre-exam work is typically well over 40/50.
- The exam focuses on questions that require understanding rather than routine calculation. A student's pre-exam mark is not a good predictor of the exam mark.

Weightings

The final mark will be made up as follows:

Assessment task	**Weight**	**Course Learning Outcomes**	**(MATH1141 only)**
Online tutorials	40%	1, 2, 3, 5, 6	
(Lab Tests 1 and 2: 15% each; Weekly online: 10%)			
Assignment	10%	1, 2, 3, 4	5, 6
End of term exam	50%	All	

Each type of assessment is described below in detail.

Note:

a. You will be able to view your final exam timetable on myUNSW. Details of when this timetable will be released is available on the university website.

https://student.unsw.edu.au/dates-and-timetables

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

https://student.unsw.edu.au/conduct

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

c. UNSW assesses students under a standards based assessment policy. For how this policy is applied within the School of Mathematics and Statistics, please visit the web site:
https://www.maths.unsw.edu.au/currentstudents/assessment-policies

d. For information on how the School implements special consideration policies for assessments during the term and the final examination, refer to the School's website:

https://www.maths.unsw.edu.au/currentstudents/special-consideration-illness-misadventure

Online Tutorials

The Online Tutorials have a weekly component and two supervised tests in the Red-Centre labs based on this and similar material that will also be available online before the tests. The time of these tests is shown in your timetable as “Other”.

The best 8 of the 10 Weekly Online Tutorials will contribute 10% of your final mark and each of the supervised tests will contribute 15%.

The supervised tests will be conducted in a computer lab but for the first of these tests you will not be allowed to use and software such as Maple. For the second test you will need to use Maple to answer some of the questions.

The second test will consist mostly of questions from the Maple coding topics of the Online Tutorials in addition to some algebra and calculus questions.

The Maple coding component of this test will be on the features of Maple which are covered in Chapter 1 and all of Chapter 2 (only up to section 11 in Chapter 2) of the First Year Maple Notes and some algebra and calculus questions from the Online Tutorials.

You will NOT need to remember the exact syntax of each command because you will have access to the following resources during the test:

e. the First Year Maple Notes (in PDF);
f. the self-paced lessons from Moodle; and,
g. Maple’s in-built help pages.

You will not have access any algebra or calculus notes or to the internet during the test.

All of the possible test problems are provided in your MATH1131 and MATH1141 Maple TA classes. There you will also find a practice test with the same format as the actual Online Tutorial Lab Tests. You are allowed an unlimited number of attempts at the practice tests.

You are expected to have worked out exactly how to answer the questions before you attend the tests because you are allowed unlimited practice at the actual test questions, and you can view your results for these tests in the Maple TA gradebook.

Assignment

The purpose of the assignment is to improve your mathematical writing by providing feedback on your writing and helping you to recognise good mathematical writing. It will also give you practice at presenting solutions to exam style questions.

The questions will be presented to you on Maple TA and you will write solutions to these questions. You will be able to check the correctness some parts of your answer using Maple TA so your main task will be to present your answers well with good explanations of your working.

Your work will need to be typed (not hand written and scanned) and you will submit your work online through links on Moodle. The assignment deadline will be 5pm on Friday of week 7. A penalty of 10% per week day late will be applied to late submissions.

Complete details of the process for this will be provided when the assignment is released. Note that the marking criteria are focused on how you explain and present your answers.

End of Term Examination

The final exam covers material from the whole of the algebra, calculus and computing (Maple) syllabi. The best guide to the style and level of difficulty is the past exam papers. The course pack contains a book of past exam papers with worked solutions. To see the exact form of the past exam papers, including instructions on the front cover and the tables of integrals and standard normal probabilities that are provided, search for “MATH1131” or “MATH1141” on the library website. 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 other assessments will be examined. The end of term exam may contain some sub-

questions requiring knowledge of Maple.

The format of this term's exam will be the same as for term 1 2019 which was different to previous exams.

The assessment tasks during the term allow repeated attempts over an extended period and resources are available to students attempting these assessments. As a result, students should be aiming for a high mark in the pre-exam assessment and this indicates significant progress towards achieving the learning outcomes of this course. The exam is time limited, allows no resources and has more complex questions. Therefore a high mark in the pre-exam assessment is not always an accurate indication of the final course mark.

Additional information for MATH1141 Higher Mathematics 1A

Content: Higher Mathematics 1A includes everything which is in the MATH1131 course 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. The assessment in MATH1141 has a greater emphasis on proof and abstraction and covers a wider range of examples. The syllabus sections of this booklet indicate the additional topics for MATH1141.

Problem sets: The basic problem sets for MATH1141 are the same for MATH1131, but you should pay special attention to the problems labelled [H] and [X] because they are particularly intended for the Higher course. It is also important to work through all the [R] labelled questions to make sure you get adequate practice on more routine problems.

Assessment: Marks in Higher Mathematics 1A will be moderated so that students in the higher course MATH1141 are not at any disadvantage compared to students in the ordinary course MATH1131. The final examination will contain at least one question in common between the two courses so that student achievement in the two courses can be compared.

Schedule of all assessments

Lectures and tutorials run during weeks 1 to 10. The table below gives the schedule all assessments. Each Weekly Online Tutorial is due at the end of the week shown.

Week	Assignment/lab tests	Weekly Online Tutorials
Week 1		**Start work on your Online Tutorial!**
Week 2		**Online Tutorial 1 due Monday 1pm**
Week 3		**Online Tutorial 2 due Monday 1pm**
Week 4	**Online Tutorial Lab Test for MATH1141**	**Online Tutorial 3 due Monday 1pm**
Week 5	**Online Tutorial Lab Test 1 for MATH1131**	**Online Tutorial 4 due Monday 1pm**
Week 6		**Online Tutorial 5 due Monday 1pm**
Week 7	**Assignment due Friday 17:00**	**Online Tutorial 6 due Monday 1pm**
Week 8	**Online Tutorial Lab Test 2 in MATH1141**	**Online Tutorial 7 due Monday 1pm**
Week 9	**Online Tutorial Lab Test 2 in MATH1131**	**Online Tutorial 8 Monday 1pm**

Week 10		**Online Tutorial 9 due Monday 1pm**
Week 11		**Online Tutorial 10 due Monday 1pm**
Study break		
End of term examination – check UNSW exam timetable for details **Web link:**		

Calculator Information

For end of term UNSW exams, students must supply their own calculator. Only calculators on the UNSW list of approved calculators may be used in the end of term exams. Before the exam period, calculators must be given a "UNSW approved" sticker, obtained 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 term exams is available at:

https://student.unsw.edu.au/exam-approved-calculators-and-computers

6. Expectations of students

School 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 of New South Wales. 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 Pages on the Maths Stats 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 Maths Stats web site starting at:

https://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 procedure in it.

Academic integrity, referencing and plagiarism

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits**:** honesty, trust, fairness, respect, responsibility and courage.[1] At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* web pages:

  https://www.maths.unsw.edu.au/currentstudents/current-students

- The *ELISE* training webpages:

  http://subjectguides.library.unsw.edu.au/elise

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

- The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student:

https://student.unsw.edu.au/conduct

University Statement on Plagiarism

This statement has been adapted from statements by the St James Ethics Centre, the University of Newcastle, and the University of Melbourne.

Plagiarism is the presentation of the thoughts or work of another as one's own. 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.
- 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:

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.

7. Readings and resources

Course Pack

Your course pack should contain the following five items:

- *Algebra Notes (for MATH1131/1141)*
- *Calculus Notes (for MATH1131/1141)*

- *Past Exam Papers Booklet*
- *First Year Maple Notes*

A printed version of the course pack can be purchased from the bookshop. These items can also be downloaded from UNSW Moodle, but many students find the hardcopy more efficient for study.

NB: The Course Outline can be downloaded from Moodle or the School website only.

Information on administrative matters, lectures, tutorials, assessment, syllabuses, class tests, computing, special consideration and additional assessment.

Textbook

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

Note, the 10h Edition of the textbook above comes with access to the electronic resources known as WileyPlus. This electronic version provides internet access to the textbook, problems, worked solutions, test (for self-assessment) and other electronic resources related to the text material. If purchased from the UNSW Bookshop, you will have access to the WileyPlus server for one year; it is possible to renew the web access on a yearly basis or for one year, at a fee determined by the publisher. Note that these WileyPlus electronic resources are provided by the publisher John Wiley, and **not** by the School of Mathematics and Statistics. Any difficulty that you might experience with WileyPlus must be resolved with the publisher.

8. Getting help outside tutorials

Staff Consultations

From week 2 there will be a roster which shows for each hour of the week a list of names of members of staff who are available to help students in the first year mathematics courses, no appointment is necessary. This roster is displayed on various notice board on level 3 of the Red-Centre, the School's website and the Moodle course page.

Mathematics Drop-in Centre

The Maths drop-in centre provides free help to students with certain first and second year mathematics courses. First year courses supported are all first year MATH courses except for MATH1041 are supported. The Maths drop-in centre office is in RC-3064, and opening times during term is typically 10am to 3pm from Mondays to Fridays. The Maths drop-in centre schedule will be available on the Schools website and Moodle by the end of week 1. Please note that no appointment is necessary, this is a drop-in arrangement to obtain one-on-one help from tutors.

Lab Consultants

For help with the Maple computing component of the first year courses, consultants will be available in the Red Centre lab RC-G012B from 11am to 4pm each teaching day in weeks 1 to 9. For more details, visit website:

https://www.maths.unsw.edu.au/currentstudents/maple-lab-consultants

Additional support for students

- The Current Students Gateway:
- Academic Skills and Support:
- Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
- Disability Support Services:
- UNSW IT Service Centre:

9. Applications for Special Consideration

Please adhere to the Special Consideration Policy and Procedures provided on the web page below when applying for special consideration.

https://student.unsw.edu.au/special-consideration

Please note that the application is not considered by the Course Authority, it is considered by a centralised team of staff at the Nucleus Student Hub.

The School will contact you (via student email account) after special consideration has been granted to reschedule your missed assessment, for a *lab test or paper-based test* only.

For applications for special consideration for *assignment extensions*, please note that the new submission date and/or outcome will be communicated through the special consideration web site only, no communication will be received from the School.

For *final exams* with special consideration granted, the Exams Unit will email the rescheduled "supplementary exam" date, time and location to your student zID email account directly. Please ensure you regularly check your student email account (zID account) for this information.

The supplementary exam period/dates can be found at this web site:

https://student.unsw.edu.au/exam-dates

Please ensure you are aware of these dates and that you are available during this time.

Important Notes

- If you believe your application for Special Consideration has not been processed, you should email **specialconsideration@unsw.edu.au** immediately for advice.

- 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 Disability Support Services who provide confidential support and advice. Their web site is: https://student.unsw.edu.au/disability

  Disability Support Services (DSS) may determine that your condition requires special arrangements for assessment tasks. Once the School has been notified of these, we will make every effort to meet the arrangements specified by DSS.

- Additionally, if you have suffered significant misadventure that affects your ability to complete the course, please contact the Director of First Year, Associate Professor Jonathan Kress by email or in person for advice. The contact details are the Red Centre, level 3 room RC-3073 or by email to j.kress@unsw.edu.au

Professor B Henry

Head, School of Mathematics and Statistics

10. Algebra Syllabus

The algebra course for MATH1131 is based on the MATH1131 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.*

The lecture timetable is given below. Lecturers will try to follow this timetable, but some variations may be unavoidable.

Lecture	Topics	Algebra Notes
Chapter 1: Introduction to Vectors		
1	Vector quantities and $\mathbb{R}^n$.	1.1, 1.2
2	$\mathbb{R}^2$ and analytic geometry.	1.3
3	Points, line segments and lines. Parametric vector equations. Parallel lines.	1.4
4	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.	1.5
Chapter 2. Vector geometry		
5	Lengths, angles and the dot product in $\mathbb{R}^2$, $\mathbb{R}^3$, $\mathbb{R}^n$,	2.1, 2.2
6	Orthogonality and orthonormal basis, projection of one vector on another. Orthonormal basis vectors. Distance of a point to a line.	2.3
7	Cross product: definition and arithmetic properties, geometric interpretation of cross product as perpendicular vector and area.	2.4
8	Scalar triple products, determinants and volumes. 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 $\mathbb{R}^3$.	2.5, 2.6
Chapter 3: Complex Numbers		
9	Development of number systems and closure. Definition of complex numbers and of complex number addition, subtraction and multiplication.	3.1, 3.2, start 3.3
10	Division, equality, real and imaginary parts, complex conjugates.	Finish 3.3, 3.4
11	Argand diagram, polar form, modulus, argument.	3.5, 3.6
12	De Moivre's Theorem and Euler's Formula. Arithmetic of polar forms.	3.7, 3.7.1
13	Powers and roots of complex numbers. Binomial theorem and Pascal's triangle.	3.72, 3.73 start 3.8

Lecture	Topics	Algebra Notes
14	Trigonometry and geometry.	Finish 3.8, 3.9
15	Complex polynomials. Fundamental theorem of algebra, factorization theorem, factorization of complex polynomials of the form $z^n - z_0$, real linear and quadratic factors of real polynomials.	3.10
Chapter 4: Linear Equations and Matrices		
16	Introduction to systems of linear equations. Solution of 2 × 2 and 3 × 3 systems and geometrical interpretations.	4.1
17	Matrix notation. Elementary row operations	4.2, 4.3
18	Solving systems of equations by Gaussian elimination	4.4
19	Deducing solubility from row-echelon form. Solving systems with indeterminate right hand side.	4.5, 4.6
20	General properties of solutions of $A\boldsymbol{x} = \boldsymbol{b}$	4.7, 4.8
Chapter 5: Matrices		
21	Operations on matrices. Transposes.	5.1, 5.2
22	Inverses and definition of determinants.	5.3, 5.4
23	Properties of determinants.	5.4
24	Review	

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. 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. Questions marked with a [**V**] have a video solution available from the course page for this subject on Moodle.

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

11. Calculus Syllabus

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 10th edition of Salas & Hille are shown as SH10.

Lecture	Topics	SH10	SP
Chapter 1: Sets, inequalities and functions			
1	$\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$. Open and closed intervals. Inequalities.	1.2, 1.3	1, 2
2	Functions: sums, products, quotients, composites. Polynomials, rational functions, trig functions as examples of continuous functions. Implicitly defined functions.	1.6-1.7	3, 4
Chapter 2: Limits			
3	MATH1131: Informal definition of limit as $x \to a$ (a finite). MATH1131: Formal definition of limit as $x \to a$ (a finite).	2.1, 2.2 pp177-178 & 195-198	5
4	Formal definition of limit as $x \to \infty$. Limit rules. The pinching theorem.	2.3, 2.5	
Chapter 3: Properties of continuous functions			
5	Combinations of continuous functions. Intermediate Value Theorem.	2.4	
6	Min-max Theorem. Relative and absolute maxima and minima	2.6, B1, B2, 4.3-4.5	
Chapter 4: Differentiable functions			
7	Definition of derivatives via tangents. Derivatives of sums, products, quotients and composites. Rates of change. Higher derivatives.	3.1 3.2-3.5	
8	Derivatives of polynomial, rational and trigonometric functions. Implicit differentiation. Fractional powers.	3.6, 3.6 3.7	
Chapter 5: The Mean Value Theorem and applications			
9	Mean Value Theorem and applications. MATH1141: Proof of Mean Value Theorem	4.1, 4.2	11
10	L'Hôpital's rule.	11.5, 11.6	11
Chapter 6: Inverse functions			
11	Domain, range, inverse functions. The Inverse Function Theorem.	7.1, B3	12
12	Inverse trig functions, their derivatives and graphs.	7.7	
Chapter 7: Curve sketching			
13	Odd and even functions, periodicity, calculus.		

14	Use of domain, range, intercepts, asymptotes, periodicity, symmetry and calculus. Parametrically defined curves.	4.7, 4.8	
15	Relationship between polar and Cartesian coordinates. Sketching curves in polar coordinates.	10.2 10.3	

Chapter 8: Integration

16	Riemann sums, the definite integral and its algebraic properties	5.1, B2	13
17	Indefinite integrals, primitives and the two fundamental theorems of calculus.	5.2-5.5	14
18	Integration by substitution and by parts	5.6, 8.2	18
19	Integrals on unbounded domains.		
20	Limit form of the comparison test. MATH1141: Proof of limit for of comparison test.	11.7	

Chapter 9: Logarithms and exponentials

21	Ln as primitive of $1/x$, basic properties, logarithmic Differentiation.	7.2, 7.3	
22	Exponential function as the inverse of ln, basic properties. a^x, logs to other bases.	7.4-7.6	

Chapter 10: Hyperbolic functions

23	Definitions, identities, derivatives, integrals and graphs. Inverse hyperbolic functions.	7.8 7.9	
24	Review		

Calculus 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 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**], 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**]. Problems marked [**V**] have a video solution available on Moodle.

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. Remember that working through a wide range of problems is the key to success in mathematics.

12. Computing Information

How much?

In MATH1131/1141, online self-paced lessons on Maple coding are available with each weekly online tutorial from week 2 to week 9. Maple coding question contribute part of the 20% of Online Tutorials. There will be at least 8 Online Tutorial topics on Maple and the second Online Tutorial Lab Test allow use of Maple and contain questions that will require the use of Maple.

Further, there will be exam questions worth at least another 3% of your final mark. Knowledge of Maple will contribute approximately 10% of your final mark. The Computing component depends on the other components and will require knowledge of the appropriate Algebra and Calculus.

Aim

The aim of the Computing component is twofold.

- Firstly, you will use the Symbolic Computing Package called Maple to do some mathematics on the computer. This use of Maple is integrated with the Algebra and Calculus and is designed to enhance your understanding of the mathematics involved, as well as letting you use Maple as a tool to do the mathematics. You will find the skills you acquire and things you learn useful in many other subjects you study, both within and outside the School of Mathematics. Maple enables you to tackle larger, harder and more realistic mathematical problems as it can handle all the difficult algebra and calculus for you. Furthermore, learning some Maple introduces you to some of the basic ideas in computer programming.
- Secondly, you will gain some experience in teaching yourself how to use a complicated computing package. This is a skill that will be needed in other courses at UNSW and in the workforce.

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 (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.

For more information, including opening hours, see the computing facilities webpage:

https://www.maths.unsw.edu.au/currentstudents/computing-facilities

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.

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 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 for Maple coding in the first online tutorial. Consultants will be on duty from 11am 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 “new user” and password “new user” 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 2016 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 11am 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 8 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, substituting 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.

Remote access to Maple

Maple is available for Windows, Mac and Linux however, these are not free. UNSW provides a cloud based virtual version of Maple that students in first year mathematics courses can access on their laptop. For details see the myAccess website:

https://www.myaccess.unsw.edu.au/

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 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 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.

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.

13.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	$\alpha\alpha$		Nu	$\nu\nu$	
Beta	$\beta\beta$		Xi	$\xi\xi$	
Gamma	$\gamma\gamma$	$\Gamma\Gamma$	Pi	$\pi\pi$	$\Pi\Pi$
Delta	$\delta\delta$	$\Delta\Delta$	Rho	$\rho\rho$	
Epsilon	$\epsilon\epsilon$		Sigma	$\sigma\sigma$	$\Sigma\Sigma$
Zeta	$\zeta\zeta$		Tau	$\tau\tau$	
Eta	$\eta\eta$		Phi	$\phi\phi$ or $\varphi\varphi$	$\Phi\Phi$
Theta	$\theta\theta$	$\Theta\Theta$	Chi	$\chi\chi$	
Kappa	$\kappa\kappa$		Psi	$\psi\psi$	$\Psi\Psi$
Lambda	$\lambda\lambda$	$\Lambda\Lambda$	Omega	$\omega\omega$	$\Omega\Omega$
Mu	$\mu\mu$				