Course Outline

MATH1131 Mathematics 1A

School of Mathematics and Statistics

Faculty of Science

Term 2, 2020

Contents

1. Staff

Roll	Name	Email	Office
Course Authority	A/Prof Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Algebra Lecturer Calculus Lecturer	Sean Gardiner Dr Joshua Capel	sean.gardiner@unsw.edu.au j.capel@unsw.edu.au	RC-4105 RC-5107
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

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* by the beginning of week 2.

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, Associate Professor 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 and ECON1202

Teaching times and locations: see the link on the central timetable web pages: Timetable for MATH1131: http://timetable.unsw.edu.au/2020/MATH1131.html

Offered in: Terms 1, 2 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 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.

4. Learning and teaching activities

Lecture & Tutorial Schedule

Note that some lectures and tutorials will be recorded and this may include student comments. Recorded lecturers and tutorials will be indicated on Moodle.

Lectures and tutorials run in all weeks from 1 to 10, except for week 6 which will have no classes. In Term 2 2020 live lectures will be streamed online via Blackboard Collaborate. A link will be provided on Moodle. These lectures will also be recorded and available to watch at a later time, however, it is recommended that students attend the lectures live online.

An alternative pre-recorded lecture option will also be available.

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Live Lectures	3pm to 5pm **(Online)** Wks. 1-5,7-10		1pm to 2pm **(Online)** Wks. 1-5, 7-10		12pm to 2pm **(Online)** Wk. 1-5,7-10
Tutorials (Online) Wks 1-5, 7-10.			W16A: 4-5pm	H13A: 1-2pm	F11A: 11-12pm
Other	**All "Other" classes are only for lab tests**, held **in weeks 5 & 9.** These tests will be available at a variety of times, not just those shown in the timetable.				

Classroom Tutorials

In Term 2 2020 classroom tutorials will be online using Blackboard Collaborate, a virtual classroom system. A link to the virtual classroom where you will attend your tutorial will be provided on Moodle. A laptop with internet access is recommended.

Students in MATH1131 are enrolled in one weekly classroom tutorial for week 1 to 5 and 7 to 10. 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 taken at all tutorial classes. Selected tutorials will be recorded for students to review at a later time.

The time of your Classroom Tutorial can be found on myUNSW. Students can change their tutorial via myUNSW until the end of week 1. After that time, they can only change tutorials by contacting the Mathematics and Statistics student services (see page 4) with evidence of a timetable clash or work commitments.

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.

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 of tutorials on the central timetable:

http://timetable.unsw.edu.au/2020/MATH1131.html#S2S

Online Tutorials

There is a weekly online tutorial due at 1pm on Monday of the following week. The first deadline is on Monday of week 2 (except in Term 2 2020 when it will be Tuesday of Week 2 due to a public holiday). 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 6 Online Tutorial topics each week. These will be mostly algebra and calculus topics but most weeks will also have a Maple topic and there may be other 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 There are also two Lab Tests as part of the Online Tutorials. These are described in the Assessment section below.

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.
- Your best grade from 6 of the 9 weeks will be counted towards your final grade.
- 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.

Moodle

Log in to Moodle to find announcements, general information, notes, lecture slides, 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

In Term 2 2020 all assessment will be conducted online, including Lab Tests and the End of Term Exam.

The assessment structure of MATH1131 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. Because of this, students should be aiming for a mark of 80% or greater in the Lat Tests. Marks less than 80% should be seen as a warning sign of possible failure in the course.
- The Assignment is available over an extended period and students can work on this with the benefit of all the course resources. Students who pass MATH1131 typically obtain 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. Past exam papers from 2019 or later are the best indication of what to expect in the exam.
- If your performance in or ability to complete any assessment is affected by illness or other reasons beyond your control, you may be eligible for special consideration. See Section 10 on page 13 for details.
- To pass MATH1131 you need 50% or greater overall. There is no requirement to gain any particular mark in any individual assessment items.

Weightings

The final mark will be made up as follows:

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

Each type of assessment is described in detail below.

Notes

- 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

- It is very important that you understand the University's rules for the conduct of Examinations and the penalties for **Academic Misconduct Guide**. See Section 0 :

  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.
- 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

- 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 lab tests 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". Additional times may be offered. These will be announced on Moodle.

Weekly Online Tutorials

Students are expected to complete all 9 Weeks of Online Tutorials, however, only the best 6 of the 9 Weekly Online Tutorials will contribute 10% of your final mark. Special consideration will only be considered for students who have appropriate documentation to explain missing more than 3 weeks of Online Tutorials.

Lab Tests

As well as completing the weekly online component of the Online Tutorials, you will take two Lab Tests based on the same set of questions plus some additional questions that will be provided on Maple TA for practice at least one week in advance. These tests will be conducted online in weeks 4 to 5 for the first test and weeks 8 to 9 for the second test. The actual times of these tests will be announced on Moodle at least one week before the test. Each of the Lab Tests will contribute 15%.

The Lab Tests will be conducted online in Term 2 2020. 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 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:

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

You will be allowed to use the Algebra or Calculus Notes or to sites on the internet other than Maple TA during your test.

All of the possible test problems are provided in your MATH1131 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 handwritten 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 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

In Term 2 2020 the End of Term Examination will be conducted online.

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. The style of this Term's exam will be announced on Moodle closer to the end of the Term. 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 closest to the 2019 exams 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.

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 Tuesday 1pm**
Week 3		**Online Tutorial 2 due Monday 1pm**
Week 4		**Online Tutorial 3 due Monday 1pm**
Week 5	**Online Tutorial Lab Test 1**	**Online Tutorial 4 due Monday 1pm**
Week 6	**Flexibility Week**	
Week 7	**Assignment due Friday 17:00**	**Online Tutorial 5 due Monday 1pm**
Week 8		**Online Tutorial 6 due Monday 1pm**
Week 9	**Online Tutorial Lab Test 2**	**Online Tutorial 7 due Monday 1pm**
Week 10		**Online Tutorial 8 due Monday 1pm**
Week 11		**Online Tutorial 9 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 Nucleus: Student Hub in the main Library. 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

- 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,

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

- 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.

Detection of academic misconduct

The School of Mathematics and Statistics uses a variety of means to detect and investigate potential academic misconduct in assessments, including the use of data from University systems and websites.

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 will be announced in the Moodle course page and linked to the folder in Moodle called "Help is available!" It is also provided in the link below.

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

Mathematics Drop-in Centre

The Maths drop-in Centre provides free help to students with certain first and second year mathematics courses. All first year MATH courses are supported. In Term 2 2020 the Drop-in Centre will be available online. See Moodle for details.

The Maths drop-in Centre schedule will be available on the Schools website below 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. The Maths drop-in Centre is accessible through the web link below.

https://www.maths.unsw.edu.au/currentstudents/Mathematics-Drop-in-Centre

Lab Consultants

For help with the Maple computing component of the first year courses, consultants will be available via the Drop-in Centre online. For more details, visit website:

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

Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/academic-skills
- Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
- Equitable Learning Services: https://student.unsw.edu.au/els (formerly Disability Services Unit)
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

9. Applications for Special Consideration

If you are unable to complete an assessment on time or during the proscribed period due to illness or other reason beyond your control, you can apply for special consideration.

For all information on Special Consideration, including the circumstances that are covered or excluded and how to apply, see the Special Consideration web site:

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 central team will advise you, by email to your UNSW student email, of the outcome of your application and the date of any supplementary assessment or extension as appropriate.

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 Equitable Learning Services (formerly known as the Disability Support Services) who provide confidential support and advice. Their web site is: https://student.unsw.edu.au/els
- Equitable Learning Services (ELS) 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 ELS.
- 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 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. Argand diagram, polar form, modulus, argument.	Finish 3.3, 3.4 3.5, 3.6
11	De Moivre's Theorem and Euler's Formula. Arithmetic of polar	3.7, 3.7.1

Lecture	Topics	Algebra Notes
	forms.	
12	Powers and roots of complex numbers. Binomial theorem and Pascal's triangle.	3.72, 3.73 start 3.8
13	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		
14	Introduction to systems of linear equations. Solution of 2 × 2 and 3 × 3 systems and geometrical interpretations.	4.1
15	Matrix notation. Elementary row operations	4.2, 4.3
16	Solving systems of equations by Gaussian elimination	4.4
17	Deducing solubility from row-echelon form. Solving systems with indeterminate right hand side.	4.5, 4.6
18	General properties of solutions of $A\boldsymbol{x} = \boldsymbol{b}$	4.7, 4.8
Chapter 5: Matrices		
19	Operations on matrices. Transposes.	5.1, 5.2
20	Inverses and definition of determinants.	5.3, 5.4
21	Properties of determinants.	5.4
22	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 Moodle course page.

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). MATH1141: 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. Use of domain, range, intercepts, asymptotes, periodicity, symmetry and calculus. Parametrically defined curves.	4.7, 4.8	
14	Relationship between polar and Cartesian coordinates. Sketching curves in polar coordinates.	10.2 10.3	

Chapter 8: Integration

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

Chapter 9: Logarithms and exponentials

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

Chapter 10: Hyperbolic functions

22	Definitions, identities, derivatives, integrals and graphs.	7.8
	Inverse hyperbolic functions.	7.9

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 Moodle. 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, online self-paced lessons on Maple coding are available as part of the Weekly Online Tutorials. Maple coding questions contribute part of the 10% for Online Tutorial and 20% for Lab Tests. 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

Note that at the time of writing, the Red-Centre labs are closed due to the COVID-19 situation. The lab information below is provided in case it is possible reopen the labs later in Term 2. An announcement will be made on Moodle if this occurs.

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 module in UNSW Moodle has several short instructional videos illustrating how to access and use all the computing related components of MATH1131. 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 to 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 as part of the Drop-in Centre online or in RC-G012 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://iam.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 by completing the self-contained Maple learning modules and by obtaining help, if necessary, from the Maple Lab Consultants who will be available via the Drop-in Centre online in Term 2 2020.

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 as part of the Weekly Online Tutorials which are described on page 8.

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. 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	α		Nu	ν	
Beta	β		Xi	ξ	
Gamma	γ	Γ	Pi	π	Π
Delta	δ	Δ	Rho	ρ	
Epsilon	ϵ or 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				