UNSW SYDNEY

Course Outline

MATH1151

Mathematics for Actuarial Studies and Finance 1A

School of Mathematics and Statistics

Faculty of Science

Term 1, 2023

Contents

1. Staff

Position	Name	Email	Room
Director of First Year	A/Prof. Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Course Authority	A/Prof. Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Algebra Lecturer Calculus Lecturer	Prof. Josef Dick A/Prof. Jan Zika	josef.dick@unsw.edu.au j.zika@unsw.edu.au	RC-4062 RC-4105
Möbius contact	A/Prof. Jonathan Kress	j.kress@unsw.edu.au	RC-3073

Staff consultation times are provided on Moodle and in the School of Mathematics and Statistics website for *current students* > *undergraduate* > *student services* > *help for students* page, at the beginning of each term.

2. Administrative matters

Contacting the Student Services Office

Please visit the School of Mathematics and Statistics website 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 website is http://www.maths.unsw.edu.au

If you cannot find the answer to your queries on the web pages you are welcome to contact the Student Services Office directly. The First Year Advisor in the Student Services Office is Ms Hilda Cahya. All administrative enquiries concerning first year Mathematics courses should be sent to H Cahya, 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 zStudentNo@unsw.edu.au 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

Assumed knowledge: The assumed knowledge for MATH1151 is a combined mark of at least 140 in HSC Mathematics and Mathematics Extension 1 or for students with Mathematics Extension 2 a combined mark of at least 175.

Excluded courses: MATH1011, MATH1031, MATH1131, MATH1141 and ECON1202.

MATH1151, Mathematics for Actuarial Studies and Finance 1A, is a first year course taught by the School of Mathematics and Statistics in Term 1, specifically designed for Actuarial Studies and Finance. It is worth **six units of credit**. Students, who pass MATH1151 in Term 1, continue to study MATH1251, Mathematics for Actuarial Studies and Finance 1B, in Term 2. MATH1151 is a demanding course. If you do not meet the assumed knowledge below, you should seek advice from the Director of First Year Mathematics.

Teaching times and locations: see the link on the Handbook web pages:
https://timetable.unsw.edu.au/2023/MATH1151.html#S1S

Course description

This course, together with MATH1251, provides the mathematical foundation needed for Actuarial Studies and related disciplines, as well as possible further studies in mathematics and statistics. MATH1151 builds on high school level calculus, focussing first on a more rigorous development of limits and continuous and differentiable functions, and then introduces multivariable calculus with partial derivatives, tangent planes and multivariable chain rules. The Riemann Integral is linked to differential calculus though the fundamental theorem of calculus and techniques of numerical integration are introduced. Vectors and vector geometry are further developed from high school and matrix algebra introduced. Linear equations are treated with Gaussian elimination and matrix methods, and these are used for applications such as basic input-output linear models and least squares approximation. Discrete and continuous random variables are studied including the central limit theorem. Matlab is used throughout MATH1151.

Assumed knowledge: HSC Mathematics Extension 1. Students will be expected to have achieved a combined mark of at least 140 in HSC Mathematics Advanced and HSC Mathematics Extension 1 or a combined mark of 175 in HSC Mathematics Extension 1 and Extension 2.

Course aims

The aim of MATH1151 is to provide a theoretical basis for the further study and applications of calculus that will be developed in MATH1251 and other courses, the tools needed to solve problems in linear algebra and an understanding of the probability distributions necessary for statistical analysis. Students will develop a practical understanding of how to use Matlab to apply their mathematical knowledge to computational problems.

Course learning outcomes (CLO)

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

1. Apply definitions and theorems in Algebra and Calculus to justify mathematical statements and solve problems.

2. Apply concepts and techniques from Algebra and Calculus to solve problems.
3. Use technology as an aid to solve appropriate problems in Algebra and Calculus.
4. Communicate mathematical ideas in written form using correct terminology and using technology.
5. Apply concepts in Algebra and Calculus to unexpected contexts.
6. Identify and construct valid mathematical arguments.

4. Learning and teaching activities

Lectures and Tutorial Schedule

Please note that Lectures, Classroom Tutorials and online Möbius Lessons run from week 1 to 5 and 7 to 10 according to your myUNSW timetable. Each student must be enrolled in the Lectures and a pair of tutorial timeslots.

In Term 1 2023 live lectures will be streamed online via Echo360. 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.

There are no lectures for the Matlab component of the course which is self-taught with help available in the Moodle forum and Drop-in Centre.

	Monday	Tuesday	Wednesday	Thursday	Friday
Lecture A In-person		**4 – 6pm (w1-5,7-10, Rex Vowels)**	**11am – 1pm (w1-5,7-10, Rex Vowels)**		**1pm (w1-5,7,9-10, Rex Vowels)**
Lecture B Online		**4 – 6pm (w1-5,7-10, ONLINE)**	**11am – 1pm (w1-5,7-10, ONLINE)**		**1pm (w1-5,7,9-10, ONLINE)**
WEB	This is a placeholder for the optional Tutor-led Problem/Q&A sessions. See below.				
Tutorials and EXM	Refer to your online timetable for day and time details. MATH1151: https://timetable.unsw.edu.au/2023/MATH1151.html#S1S				
Note: The lectures and tutorials on Friday 7 April (Week 8) will be cancelled due to public holiday. Previous term lecture recording might be provided for these cancelled lectures. More details will be announced on Moodle.					

Tutorials

Students in MATH1151 are enrolled a tutorial timeslot for weeks 1 to 5 and 7 to 10. In addition there will be several optional Tutor-led Problem/Q&A sessions. Times and locations are shown below. These sessions will be recorded, but in-person attendance is recommended so you can ask

questions. The Classroom Tutorial will be a mix of Algebra and Calculus each week. Note that the weekly Möbius lesson contains a poll to vote for which questions will be discussed in the Classroom Tutorial later that week.

In Term 1 2023, students can enrol in either face-to-face tutorials, or online tutorials. The face-to-face tutorials are subject to change depending on conditions within NSW. The online tutorials will use Blackboard Collaborate, a virtual classroom system. A laptop with internet access is recommended for attending live classes online.

Attendance is compulsory for all tutorials and a roll will be taken by the tutor for face-to-face classes or automatically by Blackboard Collaborate for online classes. Selected tutorials may be recorded for students to review at a later time but this is not intended as a substitute for live attendance.

The time and location of your tutorial can be found on myUNSW. Students can change their tutorial time via myUNSW until the end of week 1. After that, 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 tutorials is to give you a chance to tackle and discuss problems which you find difficult or do not 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. In addition, the Q&A session will allow students to ask questions directly and get instant answers from tutors for topics that students do not fully understand. The times and locations are shown below. You can attend any session you choose.

Tuesday 9am – 10am	Tuesday 12noon – 1pm	Tuesday 2pm – 3pm	Tuesday 3pm – 4pm
OMB G31	OMB G31	Rex Vowels Theatre	Rex Vowels Theatre

If your tutorial falls on a public holiday, it will be cancelled for that week. An alternative will be provided for that week. Details will be announced on Moodle at least one week in advance. You can find the times of tutorials on the central timetable, links above in the Lecture & Tutorial Structure table, or in the Blackboard Collaborate session list.

5. Assessments

Overview

In Term 1 2023 Lab Tests and the End of Term Exam will be conducted in-person with very limited exceptions for offshore students.

The assessment structure of MATH1151 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 Möbius lessons 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 Mastery 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

Mastery 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 MATH1151 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. The harder questions from past exams since 2020 are the best indication of what to expect in the exam, but there will be some more changes that will be announced closer to end of the term.
- 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 the section of special consideration for details.
- To pass MATH1151 you need 50% or greater overall. There is no requirement to gain any particular mark in any individual assessment items.

Weightings

Your final mark will be made up as follows:

Assessment task	**Weight**	**Course Learning Outcomes**
Weekly Möbius Lessons	10%	1, 2, 3, 5
Mastery Tests	30% (15% + 15%)	2, 3
Assignment	10%	1, 2, 4, 5, 6
End of Term Examination	50%	1, 2, 3, 4, 5, 6

Note:

- The marks for assessment items during the term available to you through Moodle.

  It is **your responsibility** to check that these marks are correct. If there is an error, contact the Course Convenor as soon as possible but no later than the time of the final exam.

  The webpage: https://student.unsw.edu.au/exams has many useful links related to the running of UNSW examinations.
- **Medical or other reasons are generally not accepted for missing the deadlines for the Weekly Mobius Lessons as these tests are available for an extended period and can be completed from anywhere and only the best 6 of 9 weeks count towards your final mark.**
- 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/exams NB: In recent years there have been cases where severe penalties have been imposed for misconduct in relation to tests and exams in Maths courses.

- Assessment criteria: 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 website: http://www.maths.unsw.edu.au/currentstudents/assessment-policies
- If you are unwell / miss your **final examination**, please refer to the Special Consideration Policy by visiting the website: https://student.unsw.edu.au/special-consideration

Weekly Möbius lessons

Students are expected to complete all 9 Weeks of the weekly Möbius lessons, however, only the best 6 of the 9 weekly Möbius lessons 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 the Möbius lessons. Note that Möbius lesson 0 does not count for marks but must be completed before Möbius lesson 1.

The weekly Möbius lessons cover topics from algebra, calculus and Matlab. You have unlimited attempts for these lessons. Students can check their answers as they are working and the highest mark for these will count, so students can attempt repeatedly until they are satisfied with their mark.

Mastery Tests

As well as completing the weekly Möbius lessons, you will take two Mastery Tests based on the same set of questions and some additional questions based on classroom tutorial questions. These tests will be conducted in week 5 for the first test and week 10 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 Mastery Tests will contribute 15%. **Students will have a single attempt for each Mastery Test**.

The Mastery Tests will be supervised in-person. Each Mastery Test has a selection of questions from both the algebra and calculus course, and the second may require the use of Matlab. Each test attempt will have a different random selection of questions from a test question bank. You will be allowed unlimited practice, with immediate feedback, on the questions in this test bank, so you are expected to have worked out exactly how to answer the questions before you attend the test.

If you miss a Mastery Test because of illness or other misadventure beyond your control, you must apply for special consideration. See the section of special consideration for details.

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

The assignment will require some use of Matlab.

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 11:59pm on Tuesday of week 9. The assignment will have a maximum mark of 10. A penalty of 5% of the maximum mark will be deducted from the awarded mark per day late up to a maximum of 5 days late. **Submissions over 5 days late will receive a mark of zero**.

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

End of Term Examination

In Term 1 2023 the End of Term Examination will be conducted using Möbius. **The exam will be conducted under supervised conditions in the Red-Centre computer labs during the official exam period.** Very limited exceptions will be allowed for students who are offshore during Term 1 and unable to travel to Sydney. The date and time of the final examination will be available on myUNSW and further details of the exam arrangements, including for students unable to come to Sydney, will be available on Moodle when the final exam timetable is released.

The final exam covers material from the whole of the algebra, calculus and computing (Matlab) syllabi.

The current assessment structure was introduced in 2022. Before 2022, the exam had a higher weighting, and the pre-exam assessments had a different structure. From 2022, the assessment tasks during the term allow repeated attempts over an extended period and focus more on basic skills. 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 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 5 and 7 to 10. The table below gives the schedule all assessments.

Week	Mastery Tests and Assignment	Weekly Möbius Lessons
1		Möbius Lesson 0 due 4pm Wednesday* Start work on Möbius Lesson 1
2		Möbius Lesson 1 due 4pm Wednesday Start work on Möbius Lesson 2
3		Möbius Lesson 2 due 4pm Wednesday Start work on Möbius Lesson 3
4		Möbius Lesson 3 due 4pm Wednesday Start work on Möbius Lesson 4
5	Mastery Test 1 (EXM class)	Möbius Lesson 4 due 4pm Wednesday Start work on Möbius Lesson 5
6	Flexibility week	
7	Assignment released	Möbius Lesson 5 due 4pm Wednesday Start work on Möbius Lesson 6
8		Möbius Lesson 6 due 4pm Wednesday Start work on Möbius Lesson 7
9	Assignment due Tuesday 11:59pm	Möbius Lesson 7 due 4pm Wednesday Start work on Möbius Lesson 8

10	Mastery Test 2 (EXM class)	Möbius Lesson 8 due 4pm Wednesday Möbius Lesson 9 due 11:59pm Sunday**
11	Monday to Thursday: Study break Friday: Start of exams – Check myUNSW for exam timetable	
End of Term examination – Check UNSW exam timetable for details		

* The deadline for Matlab lesson 0 will be extended to 4pm Wednesday of Week 2.

** The deadline for Möbius Lesson 9 is at the end of Week 10, but it will remain open (and the mark will count) until 4pm Wednesday of Week 11.

6. Course Materials

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

Once logged in, you should see a link to MATH1151 that you will take you to the MATH1151 homepage in Moodle.

Course Pack and Textbook

The course materials for MATH1151 are:

- MATH1151 Course Pack (see below);
- Introduction to Matlab;

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 are also sold through the UNSW Bookshop, while the computing laboratory notes and introduction to Matlab are free to download.

The Course Pack contains the following items:

- Algebra Notes (for MATH1151);
- Calculus Notes (from MATH1131/1141 as an additional resource);
- Calculus Problems Booklet;
- 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 MATH1151 Course Page.

7. Expectations of students

School and UNSW 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 website.

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 website 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.

Course improvement

You will be invited to complete a course evaluation form online at the end of the term.

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

The **UNSW Student Code** provides a framework for the standard of conduct expected of UNSW students with respect to their academic integrity and behaviour. It outlines the primary obligations of students and directs staff and students to the Code and related procedures.

In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties as the use of such services constitutes plagiarism because it involves using the words or ideas of others and passing them off as your own. Nor is it permissible to sell copies of lecture or tutorial notes as students do not own the rights to this intellectual property.

If a student breaches the Student Code with respect to academic integrity, the University may take disciplinary action under the **Student Misconduct Procedure**.

The UNSW Student Code and the Student Misconduct Procedure can be found at: https://student.unsw.edu.au/plagiarism

An online Module "Working with Academic Integrity" (https://student.unsw.edu.au/aim) is a six-lesson interactive self-paced Moodle module exploring and explaining all of these terms and placing them into your learning context. It will be the best one-hour investment you've ever made.

Plagiarism

Plagiarism is presenting another person's work or ideas as your own. Plagiarism is a serious breach of ethics at UNSW and is not taken lightly. So how do you avoid it? A one-minute video for an overview of how you can avoid plagiarism can be found https://student.unsw.edu.au/plagiarism.

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.

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 on the Moodle course page at the end of week 2 and can be located by visiting webpage:

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 1 2023 the Drop-in Centre is operating both in-person and online, 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 School's 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.

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

Lab Consultants

For help with the Matlab computing component of this course, consultants will be available as part of the Drop-in Centre. For more details, visit website:

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

Additional support for students

ELISE (Enabling Library and Information Skills for Everyone)

ELISE is designed to introduce new students to studying at UNSW.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW
- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

Some of these areas will be familiar to you, others will be new. Gaining a solid understanding of all the related aspects of ELISE will help you make the most of your studies at UNSW.

The *ELISE* training webpages:

https://subjectguides.library.unsw.edu.au/elise/aboutelise

Equitable Learning Services (ELS)

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 (previously known as SEADU) who provide confidential support and advice.

They assist students:

- living with disabilities
- with long- or short-term health concerns and/or mental health issues
- who are primary carers
- from low SES backgrounds
- of diverse genders, sexes and sexualities
- from refugee and refugee-like backgrounds
- from rural and remote backgrounds
- who are the first in their family to undertake a bachelor-level degree.

Their web site is: https://student.unsw.edu.au/els/services

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 your Lecturer-in-charge in the first instance.

Academic Skills Support and the Learning Centre

The Learning Centre offers academic support programs to all students at UNSW Australia. We assist students to develop approaches to learning that will enable them to succeed in their academic study. For further information on these programs please go to:

http://www.lc.unsw.edu.au/services-programs

Other Supports

- 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
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

9. 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.

10. Algebra Syllabus and Lecture Timetable

The algebra course for MATH1151 is based on the MATH1151 Algebra Notes, which are essentially reading and should be accessible at all classroom tutorials. There is very little overlap between this syllabus and the algebra specified in the NSW HSC curriculum. The computer package MATLAB will be used in the MATH1151 algebra course. An approximate lecture timetable is given below. The lecturer will try to keep to this timetable, but variations might be unavoidable, especially due to public holidays.

Chapter 1. Introduction to Vectors

Lectures 1 – 4
Vector quantities. Rules for addition and scalar multiplication of geometric vectors.
Brief mention of matrices for Matlab applications. Addition of vectors and multiplication by scalars. (Section 1.1)
Vector quantities and $\mathbb{R}^n$. (Section 1.2)
Analytic geometry and other applications. (Section 1.3)
Points, line segments and lines. Displacements. Lines in $\mathbb{R}^2$, $\mathbb{R}^3$, and $\mathbb{R}^n$. (Section 1.4) Parametric vector equations for planes in $\mathbb{R}^n$. The linear equation form of a plane. (Section 1.5)

Chapter 2. Linear Equations and Matrices

Lectures 5 – 8
Introduction to systems of linear equations. Solution of 2 × 2 and 2 × 3 systems and geometrical interpretations. (Section 2.1)
Matrix notation. (Section 2.2)
Elementary row operations, elementary matrices. (Section 2.3) Solving systems of equations via Gaussian elimination. (Section 2.4) Deducing solubility from row-echelon form. (Section 2.5)
Solving systems with indeterminate right hand side. (Section 2.6) General properties of solutions to $Ax = b$. (Section 2.7)
Applications in Actuarial Studies, Finance and Commerce. (Section 2.8)

Chapter 3. Matrices

Lectures 9 – 11
Operations on matrices. (Section 3.1) Transposes. (Section 3.2)
Inverses. (Section 3.3)
Determinants. (Section 3.4)
Applications of matrix multiplication. (Section 3.5)

Chapter 4. Vector Geometry

Lectures 12 – 14
Length, distance between points. (Section 4.1) Angles and dot product in $\mathbb{R}^2$,$\mathbb{R}^3$, $\mathbb{R}^n$. (Section 4.2)
Orthogonality and orthonormal basis, projection of one vector on another. Relationship be-tween coordinates of a vector and projections of the vector on orthonormal basis vectors. (Section 4.3)
The cross product: definition and arithmetic properties, geometric interpretation of cross product as perpendicular vector and area (Section 4.4)
Scalar triple products, determinants and volumes (Sections 4.5)
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. (Section 4.6)
Projections and least-squares approximations (Section 4.7)

Chapter 5. Probability

Lectures 15 – 22
Introduction to probability and statistics. (Section 5.1) Preliminary set theory. (Section 5.2)
Axiomatic probability, sample spaces, conditional probability, Bayes rule, independent events. (Section 5.3)

Discrete random variables (uniform, binomial, Poisson, geometric). Mean and variance of a discrete random variable. (Section 5.4)
Continuous random variables (uniform, negative exponential). Cumulative distribution functions. Mean and variance of a continuous random variable. (Section 5.5)
The normal distribution. The standard normal distribution. Evaluating normal probability integrals. Conversion from general normal distributions to standard normal distributions. Applications of the normal distribution. Estimation of probabilities. (Section 5.6)
The sampling distribution for the mean and the central limit theorem. Sums of random variables. (Section 5.7)
Approximations to the binomial distribution by the normal distribution and by the Poisson distribution. (Section 5.8)

ALGEBRA PROBLEM SETS

Selected Algebra problems for the Classroom Tutorial are selected from the Algebra problems which 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 and are included only for interest. There are a number of questions marked [M], indicating that Matlab is required in the solution of the problem.

CALCULUS SYLLABUS FOR MATH1151

The calculus syllabus assumes that students are very familiar with the mathematics contained in the NSW HSC Extension 1 course. In particular, it assumes that all students are familiar with the calculus of the exponential and log functions. Whereas the algebra strand of the course contains many results of an algorithmic nature, the calculus strand emphasises an approach to mathematics of a more abstract and conceptual kind. This emphasis is designed to help you cope with more advanced mathematics that you will likely meet in later years. The times given for the various topics are approximate only.

1. The Exponential Function (4 hours)

Real numbers, the Least Upper Bound Axiom, the exponential and log functions, the hyperbolic and inverse hyperbolic functions.

2. Limits (4 hours)

Formal definitions of limits as $x \to \infty$, informal definitions of limits at finite points, the Pinching Principle, continuity and types of discontinuity, Bolzano's Theorem, the intermediate value theorem, the min-max theorem, "little-oh" notation.

3. Differentiation (3 hours)

Definition of the derivative, approximation by the tangent line, the chain rule, implicit differentiation, critical points, Rolle's Theorem, the Mean Value Theorem, applications, L'Hôpital's rule.

4. Parametric Curves and Polar Coordinates (1 hour)

Parametric curves, polar coordinates, gradients

5. The Riemann Integral (4 hours)

Riemann sums and the Riemann integral, the Mean Value Theorem for integrals, the Fundamental Theorems, integration by substitution and parts, improper integrals of the 1st kind, comparison theorems.

6. Quadrature (2 hours)

The Midpoint, Trapezoid and Simpson's Rules with error estimations.

7. Functions of Several Variables (4 hours)

Surfaces in 2-space, partial differentiation, the tangent plane and differentiability, Jacobians, differentials, Chain rules, Leibniz's Rule, gradients.

PROBLEM SETS

Selected Calculus problems for the Classroom Tutorial are selected from the problems in the MATH1151 Calculus Problems booklet. They come in three varieties: really challenging problems, marked with **; slightly harder than normal questions, marked with * and standard level questions with no additional markings at all. All students should make sure that they attempt and can do these standard questions and make serious attempts at the * and ** questions. Remember that working through a wide range of problems is the key to success in mathematics.

11. Computing Information

Background

The University of NSW 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. What you learn with us will be of direct use in later years since many other Schools in the University (particularly the Engineering and Science Schools) are now starting to use the same packages as the School of Mathematics and Statistics. Also, experience with our computing packages will make it easier to learn computing elsewhere. All Mathematics and Statistics majors should consider doing further computing courses, such as MATH2301 Mathematical Computing, in their degree program.

Aim

The primary aim of the computing component of MATH1151 is to develop your skills in using Matlab. The name of this software package derives from MATrix LABoratory, reflecting its origins in the early 1980s as an interactive interface to a library of Fortran routines for matrix computations. A company called The MathWorks Inc. produces Matlab, and has progressively expanded the package to cover many areas of mathematics besides linear algebra. Matlab now has a highly-developed programming language, a sophisticated graphics system, and software tools including a debugger, a profiler, and support for developing graphical user interfaces. Another feature of Matlab is its ability to work with Fortran or C/C++ codes, as well as with Microsoft Excel. These advanced features of Matlab are essential for many commercial applications, but in MATH1151 you will only be expected to use a restricted number of the basic mathematical and graphical functions in Matlab, and do some simple programming.

Computing Lab

The Red-Centre labs are closed at the time of production. This information is included in case they are re-opened during the term.

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.

For more information, including opening hours, see the computing facilities webpage: https://www.maths.unsw.edu.au/currentstudents/computing-information

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

All of the software that you need for this course is installed on the computers in the Red-Centre labs. This software can also be accessed from your own computer through the university's myAccess service. For details see the myAccess website: https://www.myaccess.unsw.edu.au/

The UNSW Matlab licence also allows you to install a copy of Matlab on your own computer. For information on using the myAccess service and how to install Matlab, please see the information provided on this course's Moodle page.

How to Start

You should read the *Introduction to Matlab* notes which can be found at:
https://www.maths.unsw.edu.au/currentstudents/first-year-computing-notes

In Week 1 you should complete the Matlab introductory module and in Möbius you should complete the assignment "Introduction to Möbius Lessons".

Additionally, the MATH1151 module in Moodle has several short instructional videos illustrating how to access and use all the computing related components of MATH1151.

From week 1 onwards, you are expected to master the material in the Computing Notes by completing the self-contained Matlab learning modules and by obtaining help, if necessary, from the Consultants available in the Drop-in Centre.

Learning Matlab

As a rough guide, you should spend around one hour per week on computing in MATH1151. This is an average figure, and we recommend that you make a special effort in the first few weeks to master the basics. In lectures, you will see examples of how Matlab is used to solve a variety of mathematical problems, but there is not sufficient class time for a systematic treatment of Matlab.

When you come to write M-files (scripts or functions) you will need to use an editor. We recommend the built-in Matlab editor (type help edit) because it has several features specifically tailored to writing Matlab programs. Nevertheless, you can use any of the other available editor.

Maple

The other first-year mathematics courses use a different software package called Maple. However, the School of Risk and Actuarial Studies has advised us that Matlab is more suitable for their purposes and would be introduced into their second- and third-year courses. Many later-year applied mathematics courses — including those taken by students in Finance/Mathematics programs — already use Matlab. Some later-year pure mathematics courses use Maple.

The main distinction between the two software packages is that whereas Matlab works primarily with arrays of numeric data, Maple works primarily with symbolic expressions. We do not expect you to learn Maple in MATH1151.

Matlab Toolboxes

As well as its kernel routines, Matlab has a collection of specialised software libraries called toolboxes. We will not use any of them in MATH1151 or MATH1251, but in later-year courses many of you will see the financial, statistics and the optimization toolboxes. Use the Matlab help command to see a complete list of the toolboxes available on the lab PCs.

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 2020* 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 Matlab or 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 Matlab or Maple to check your answers. You may also use Matlab and Maple for other courses.

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

12. 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				