

The University of New South Wales

MATH1131 Mathematics 1A

MATH1141 Higher Mathematics 1A

INFORMATION BOOKLET

School of Mathematics and Statistics

Semester 1 2009

CONTENTS OF THE MATH1131/1141 COURSE PACK 2009

Your course pack should contain the following four items:

1. *Information Booklet*

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

2. *Algebra Notes (for MATH1131/1141)*

3. *Calculus Notes (for MATH1131/1141)*

4. *Past Exam Papers Booklet*

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GENERAL INFORMATION FOR MATH1131 and MATH1141

Background

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

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

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

For the excluded courses for MATH1141 replace MATH1141 by MATH1131.

Assumed Knowledge

The assumed knowledge for MATH1131 is a mark of at least 100 on the NSW HSC Mathematics Extension 1 course. However, students with marks below 120 are advised that they will need work especially conscientiously. MATH1131 is also an appropriate course for those students who only attempted the NSW HSC Mathematics course and who attained a mark of 90. Students who attained a mark below 80 on that course are likely to find MATH1131 to be very difficult. If you feel after two weeks of semester that MATH1131 is too demanding for you, then you should seek advice from the First Year Office, RC-3072.

Students with a Mathematics Extension 2 combined mark above 175 or an Extension 1 combined mark above 140 are encouraged to enrol in MATH1141, which is the higher version of MATH1131.

Aims

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

Learning Outcomes

A student should be able to:

- state definitions as specified in the syllabus,

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

Advice to students

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

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

Teaching Strategies

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

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

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

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

Statement on Assessment

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

It is unusual for questions on class tests to be marked out of more than 3 or 4 marks, and advice is given to tutors as to how those marks are to be awarded. Generally part-marks are awarded according to the number of correct steps made in answering the question. Students should raise any concerns that they have regarding their marks with their tutor when their

papers are returned. If their concerns are not satisfactorily resolved, they may speak to the First Year Director.

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

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

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

Contacting the First Year Office

The School of Mathematics and Statistics web-site

<http://www.maths.unsw.edu.au>

contains many pages of useful information on mathematics courses, school policies and how to obtain help, both academic and administrative. If you cannot find the answer to your queries on the web pages you are welcome to contact the First Year office directly.

The student administration officer in the First Year Office of the School of Mathematics and Statistics is Mrs N. Narouz (Neffi). All administrative enquiries concerning first year Mathematics courses should be sent to Mrs Narouz, either:

- by email to fy.MathsStats@unsw.edu.au
- by phone to 9385 7011
- or in person in room RC-3072 (between 9am to 12 noon or 2pm to 4pm)

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

zSTUDENTNO@student.unsw.edu.au

in the first instance.

Lecturers in charge

For the Algebra component:

Lecturer-in-charge Mr P. Brown Room 5106, Red Centre

For the Calculus component:

Lecturer-in-charge Dr D. Angell Room 3093, Red Centre

For the Computing component:

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

Lectures

Students in MATH1131 and MATH1141 are generally enrolled in a lecture group, where a lecture group consists of a sequence of two Algebra lectures and two Calculus lectures each week. There are three lecture groups in MATH1131 and one in MATH1141.

MATH 1131

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures Group 1			12-1 Alg CLB-7 Pahor 1-2 Calc CLB-7 Blennerhasset		9-10 Calc CLB-7 Blennerhasset 10-11 Alg CLB-7 Pahor
Lectures Group 2		10-11 Alg Mathews-A Womersley 11-12 Calc Mathews-A Angell		11-12 Calc Mathews-A Angell 12-1 Alg Mathews-A Womersley	
Lectures Group 3	9-10 Alg KBT Wildberger 10-11 Calc KBT Steele		4-5 Calc KBT Steele 5-6 Alg KBT Wildberger		

MATH 1141

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures			12-1 Alg Rex Vowels Brown 1-2 Calc Rex Vowels Doust		9-10 Alg Rex Vowels Brown 10-11 Calc Rex Vowels Doust

It is important to note that:

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

Tutorials

Students in MATH1131 and MATH1141 are enrolled in two tutorials, one for algebra and one for calculus. The algebra tutorial is timetabled for the 2nd half of the week, whilst the calculus tutorial is scheduled for the 1st half of the week. Students are able to change their tutorials, via myUNSW, until the end of week 1, and after that time, they can only change their tutorials with the agreement of the First Year Office, RC3072. To change a tutorial you will need to provide proof of a timetable clash or work commitments.

Note that

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

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

- Study your lecture notes and attempt relevant problems **before** the tutorial so that you can find out the areas in which you have difficulties.
- Make sure that your tutor is aware of the areas in which you need help.
- Be as specific as possible in describing your difficulties — don't just say "could you explain about differentiation".
- Be an active participant in tutorials, asking and answering questions rather than just sitting and watching.

All the tests and assignments which you submit (except formal examination scripts) will be marked by your tutor and returned through tutorials.

Self-paced online Modules

Online self-paced learning modules are available in My eLearning. These modules guide students through the computing component of this course. Students are introduced to the computing facilities and the online environment in week 0, and are expected to complete the online modules by 9pm Friday of week 6. Each module contains a graded quiz and the completed seven modules contribute 4% to the final grade. These modules are integrated with, and enhance the lecture and tutorial content presented in Calculus and Algebra. Learning content will be accessible at all times for learning and revision, but quizzes will only be available for credit until the published deadlines.

Week 0

Week 0 is an integral part of the teaching semester and within MATH1131 and MATH1141 is used to introduce students to the computing facilities and electronic resources available for the course. There are several computing lectures or demonstration sessions during week 0 and you should attend at least one of these lectures and follow this with a session in the School's computing labs. Computing consultants will be available in the computing labs at specified times during week 0 in the event that you experience difficulties with the computing environment within the School. Details of the introductory lecture times will be posted on the School's web-site as a link from the page

<http://www.maths.unsw.edu.au/students/current/currenthome.html>

and on the MATH1131 or MATH1141 page on My eLearning (see page 8) and more information on the computing component in MATH1131 and MATH1141 is given later in this booklet.

Getting help outside tutorials

If you are having difficulty understanding the lectures or doing the suggested problems, always try to get help through your tutorials. In most cases there will be other students who are having the same difficulties and it is better to provide help to all at once rather than giving the same explanation to ten or twenty students individually outside class.

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

You can also avail yourself of the **Student Support Scheme**. This Scheme is financed by the School of Mathematics and Statistics and is staffed by later year mathematics students. It will be open to provide tutorial help to 1st year students from Week 3: details will be provided to you through lectures. Check the website:

<http://www.maths.unsw.edu.au/students/current/help/sss.html>

Course Materials

The course materials for MATH1131/1141 are:

MATH1131/1141 *Course Pack 2009*.

Computing Notes For First Year Mathematics courses 2009.

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

The latest edition of the textbook, Salas, Hille and Etgen *Calculus - One and Several Variables*, 10th Edition comes packaged with access to the electronic resources known as WileyPlus. This electronic version provides internet access to the textbook, problems, worked solutions, tests (for self-assessment) and other electronic resources related to the text material. The purchase

of the text from the UNSW Bookshop gives web access to the WileyPlus server for one year; it is possible to renew the web access on a yearly basis at a fee determined by the publisher. It is also possible to purchase just the web access to the electronic version of the textbook for one year. This can also be done at the UNSW Bookshop. Note that these WileyPlus electronic resources are provided by the publisher John Wiley, and **not** by the School of Mathematics and Statistics. Any difficulties that you might have with access to WileyPlus must be resolved directly with the publisher.

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

The Course Pack contains the following items:

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

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

My eLearning Vista

The School of Mathematics and Statistics makes extensive use of the centrally provided electronic learning environment known as “My eLearning Vista”. This information booklet, the algebra and calculus problems sets and computing information are all available via the appropriate course module on the My eLearning server. Access to this server is via any suitably configured web browser from any computer with an internet connection. The URL for My eLearning Vista is

<http://vista.elearning.unsw.edu.au>

and the School of Mathematics and Statistics web pages for Current Students also has a Quick-link to My eLearning Vista. From this page you will need to click the link “UNSW Online Courses”, which takes you to another page where, after a warning about links to external sites, there is a “Log In” button to click. After clicking the Log In button you will be prompted for your User name (z immediately followed by your student number) and your Password, also known as your Unipass. Once logged in you will have a choice of modules for all your courses, including your current mathematics course. The home pages for all My eLearning Vista modules for First Year Mathematics courses have a similar structure, with links to “Important Information”, “Course Materials”, etc. The “Maths Info” is particularly important as this takes you to the log-in page of the Student Portal for the School of Mathematics and Statistics. Once through this gateway you have access to your mathematics assessment marks, including results of any class tests that may be available and your provisional end of semester mark. You also set your mathematics computing laboratory password from this portal.

Problem sets

Problems for Algebra are included in the Algebra Notes. Similarly, problems for Calculus are included in the Calculus Notes. Problems for the Maple computing component are available online in the Maple self-paced learning modules folder on My eLearning, and on page 34 of this booklet.

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

Computing

In addition to the Calculus and Algebra components, there is a Computing component in MATH1131/1141. This is partly interwoven with the Calculus and Algebra components and partly independent of them. More information about the Computing component is given later in this booklet and in the booklet *Computing Notes For First Year Mathematics courses 2009*. **Computing consultants are available in laboratory G012 from 12noon to 4pm every weekday.**

Calculator Information

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

BEFORE the exam period calculators must be given a UNSW "approved calculator" sticker, obtainable from the School of Mathematics and Statistics Office, and other student or Faculty centres.

The UNSW list of calculators approved for use in end of semester exams is available at

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

Assessment

The final raw mark will be made up as follows:

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

The On-line Computing test and the Laboratory computing test are described in the Computing Information section of this booklet.

Note that:

- You will **not** be allowed to take a calculator into class tests.
- Tutors are expected to enter class test marks into the School's database within a fortnight of the test being sat. These marks are then available to you through the Student Web Portal accessed via the "Maths Info" link on the home page of MATH1131

or MATH1141 on the UNSW My eLearning server. Quick access to My eLearning is obtained via the “My eLearning Vista” links on the School web pages or via the URL <http://vista.elearning.unsw.edu.au>. It is **your responsibility** to check that these marks are correct and you should **keep marked tests until the end of semester** in case an error has been made in recording the marks. If there is an error, either speak to your tutor or bring your test paper to the First Year Office as soon as possible but no later than Friday 12th June.

- Your final raw mark is scaled by the School of Mathematics and Statistics to produce your final mark. This is done so that the final distribution of marks is consistent with general university guidelines regarding the percentages of students with various grades, and to maintain consistent standards from year to year. A small committee of the teaching staff determines this final scaling.
- Once the examinations section finalises the examination timetable, you will be able to find out the time and place of the MATH1131/1141 examination from myUNSW. The web page

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

has many useful links related to the running of UNSW examinations.

- Be aware that a **final mark of 49 often means that the course has been failed and has to be repeated**. Therefore, it is very important that you attempt all tests.
- If your final mark is in the range 46-49 then you may be awarded the grade of “Pass Conceded” provided your average mark for all your courses is sufficiently high. This decision is not made by the School of Mathematics and Statistics.
- **Medicals will generally not be accepted for the online or computing tests**. See section on “Computing Information”.

Online Algebra and Calculus tests

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

<http://mapleta.elearning.unsw.edu.au/mapleta>

The schedule for these online tests for MATH1131 is given below.

Test	Available	Due
TP1 - Math 1A Calculus online test 1	2pm Wednesday 18/3/2009	4pm Friday 27/3/2009
TP2 - Math 1A Algebra online test 1	2pm Monday 6/4/2009	1pm Wednesday 22/4/2009
TP3 - Math 1A Calculus online test 2	2pm Wednesday 22/4/2009	4pm Friday 1/5/2009
TP4 - Math 1A Algebra online test 2	2pm Wednesday 13/5/2009	1pm Wednesday 27/5/2009

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

Test	Available	Due
TP1 - Math 1A Calculus online test 1	2pm Wednesday 18/3/2009	4pm Wednesday 25/3/2009
TP2 - Math 1A Algebra online test 1	2pm Monday 6/4/2009	4pm Monday 20/4/2009
TP3 - Math 1A Calculus online test 2	2pm Wednesday 22/4/2009	4pm Wednesday 29/4/2009
TP4 - Math 1A Algebra online test 2	2pm Wednesday 13/5/2009	4pm Monday 25/5/2009

The material covered by these tests is the same as for the tutorial algebra and calculus tests, as given on page 21 and 27.

Detailed information on how to use the online testing system is available from the MATH1131 and MATH1141 course module on My eLearning in the “Assessment” section of the “Course Materials” folder. In this section there is also a link, labelled Maple TA, to the web page where the tests are available. Despite the name “Maple” appearing in the link, these online tests are algebra and calculus tests and should **not** be confused with any other online test. To give you some familiarity with the online testing system a practice test will be available from week 0.

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

Note:

- the first test becomes available on Wednesday of week 2;
- each attempt at these tests must be your own work, but you are encouraged to discuss the methods required with other students;
- each version of a test will be slightly different, so don't just copy answers from one attempt to the next.

Class tests

Details of the dates and content of tests are given later in this booklet. Sample copies of the tests are included in the Algebra and the Calculus booklets.

Note that

- You **MUST** be enrolled in an Algebra tutorial and a Calculus tutorial and **YOU MUST TAKE EACH TEST IN THE TUTORIAL TO WHICH YOU HAVE BEEN OFFICIALLY ALLOCATED.**
- To each test you must bring
 - your **Student ID** card
 - some blank A4 writing paper
 - a **stapler** (so that you can staple a cover sheet to your answers).
- Normal exam conditions apply in tests. In particular, you must not bring any kind of written material into the test and you must not try to get assistance from (or give assistance to) any other person.

- You will **not** be allowed to use a calculator in class tests.
- When your test answers have been marked and handed back to you by your tutor, don't try to change your answers or falsify the marks awarded — a student who tried to do this recently was penalised by being given a failure in the course.
- Your **best three scores** in the four tests will be counted towards your final assessment mark.

Interpretation of test results

The average mark for tests in MATH1131 is between 6 and 7 out of 10. Past experience is that students are likely to have difficulty passing this course if their average test mark is less than 5. If you find that your average after the first two tests is less than 5, you should talk to your tutors about your situation and what you can do about it.

Graduate Attributes

This course will provide you with an in-depth knowledge of topics in Calculus and Linear Algebra, and show, through the lectures, how this mathematics can be applied in interdisciplinary contexts. Your skills in analytical critical thinking and problem solving will improve because of the illustrative examples used in lectures and because of the problem based tutorial classes. These mathematical problem solving skills, which are based on logical arguments and specific techniques, are generic problem solving skills that can be applied in multidisciplinary work. The course will also engage you in independent and reflective learning through your independent mastery of tutorial problems and the Maple computing package. You will be encouraged to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Academic misconduct

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

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

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

Illness and other problems

If your performance in this course is affected by illness or other serious difficulties which are beyond your control, you can apply for Special Consideration and you may be offered the opportunity for Additional Assessment. See also the sub-section *Getting advice* on page 14.

In order to be offered Additional Assessment it is essential that you **follow exactly the procedures set out in the document entitled “Application for Special Consideration in First Year Mathematics Courses 2009.”** A copy of this document is included in this booklet on page 16. You should read it carefully now and keep it for reference at the time when

you actually need it. Each year there are some students who fail a course because they didn't follow these instructions. Take particular note that

- The School will **NOT** contact you to tell you that you have been granted Additional Assessment. It is **YOUR RESPONSIBILITY** to find this out by following the instructions in the document mentioned above.
- **If you have a poor record of attendance or performance during the semester you may be failed regardless of illness or compassionate grounds affecting the final exam.**

Note also that

- If illness affects your attendance at or performance in a **class test**, do **not** make an application for Special Consideration. Simply show a medical certificate to your tutor and this will be taken into account when calculating your final assessment mark.
- Transport delays and oversleeping will **not** be accepted as reasons for missing class tests. (But note that only your best three test results are counted for assessment.)
- Because it is possible to sit the computing tests on many days, **except in very unusual circumstances, medicals will not be accepted as excuses for not sitting the computing test.** Therefore, it is recommended that you book to sit at an early time.
- If you arrive too late to be admitted to the end of semester exam, go **immediately** to the Mathematics and Statistics First Year Office, Room 3072, Red Centre.

Past examinations

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

Change of enrolment

The following information on changes of enrolment applies only to those who are doing MATH1131 or MATH1141 in **semester 1**.

You may feel, after some weeks of semester have passed, that you have not made the right choice between Higher Mathematics 1, Mathematics 1 and Fundamentals of Mathematics B. If so, you should discuss the situation with your tutors or with me (Director of First Year Studies in Mathematics, Room 3072, Red Centre).

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

Information and handouts

Important announcements may be made in lectures. Handouts may be issued in lectures or tutorials. If you miss a lecture or tutorial, or arrive late for it, it is essential that you check whether you have missed any announcements or handouts. Spare copies of handouts will be available from pigeonholes near the Mathematics and Statistics School Office (Room 3070, Red Centre) for two weeks (unless they run out sooner than that).

Notices will be posted on noticeboards on Level 3 (near Room 3070) of the Red Centre. Also important information will be posted as announcements on the relevant course module on My eLearning.

The First Year Office for the School of Mathematics and Statistics is located in Room 3072, Red Centre. It is open for student enquiries in the morning between 9am and 12noon and in the afternoon between 2pm and 4pm.

School of Mathematics and Statistics Policies

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

<http://www.maths.unsw.edu.au/students/current/policies/studentpolicy.html>

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

Getting advice

Your Algebra and Calculus tutors should be able to give you most of the advice you need on mathematical and administrative matters concerning MATH1131 or MATH1141. If they cannot help you, try your lecturers or one of the two Lecturers-in-charge (their names and room numbers are shown on page 4 of this booklet). If your problems are more serious, or haven't been resolved to your satisfaction, come to see me (Peter Blennerhassett) at Room 3072, Red Centre. I am happy to see you.

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

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

ADDITIONAL INFORMATION FOR MATH1141 HIGHER MATHEMATICS 1A

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

Content

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

Assessment

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

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

**APPLICATIONS FOR SPECIAL CONSIDERATION IN
FIRST YEAR MATHEMATICS COURSES SEMESTER 1 2009**

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

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

1. **Within 3 days** of the affected examination, or at least as soon as possible, you must **submit a request for special consideration to UNSW Student Central** (Lower Ground Floor, The Chancellery) **on a special form**, which is available from the Student Central. Please note that in cases of sickness both parts **A and B** of the application form must be completed and the School of Mathematics and Statistics **will not process** an application unless part B has been fully completed by an appropriate professional. In cases other than sickness, appropriate documentation must be supplied with the application.
2. **You will NOT be granted additional assessment in a course if your performance in the course** (judged by attendance, class tests, assignments and examinations) **does not meet a minimal standard**. A total mark of at least 40% on all assessment not affected by a request for special consideration will normally be regarded as the minimal standard for award of additional assessment.
3. It is **YOUR RESPONSIBILITY** to find out **FROM THE SCHOOL OF MATHEMATICS AND STATISTICS** whether you have been granted additional assessment and when and where the additional assessment examinations will be held. **Do NOT wait to receive official results from the university**, as these results are not normally available until after the Mathematics additional assessment exams have started. Information about award of additional assessment is available from the School of Mathematics and Statistics in the following ways:
 - a) A **provisional** list of results in all Mathematics courses and of grants of additional assessment will be available via the “Maths Info” link in the My eLearning module of your course by late on **Friday 3rd July**.
 - b) A **final** list of results and of grants of additional assessment will be available via the “Maths Info” link in the My eLearning module of your course by late on **Friday 10th July**.
 - c) On **Monday 13th July ONLY**, you may telephone the School Office (9385 7111) to find out whether you have been granted additional assessment and where and when it will be held. **Note that examination results will not be given over the phone.**
4. The **timetables** for the additional assessment examinations will be available on the Mathematics website at the same time as the provisional list of results.

The mid-year additional assessment examinations will be held on the days **Tuesday 14th July to Thursday 16th July**.

5. If you have two additional assessment examinations scheduled for the same time, please consult the School of Mathematics and Statistics Office as soon as possible so that special arrangements can be made.
6. You will need to produce your UNSW Student Card to gain entry to additional assessment examinations.

IMPORTANT NOTES

- The additional assessment examination may be of a different form from the original examination and must be expected to be at least as difficult.
- If you believe that your application for special consideration has not been processed, you should immediately consult the Director of First Year Studies of the School of Mathematics and Statistics (Room 3072 Red Centre).
- If you believe that the above arrangements put you at a substantial disadvantage, you should, at the earliest possible time, send full documentation of the circumstances to the Director of First Year Studies, School of Mathematics and Statistics , University of New South Wales, Sydney, 2052.

In particular, if you suffer from a chronic or ongoing illness that has, or is likely to, put you at a serious disadvantage (or you have suffered misadventure of equivalent seriousness) then you should contact the Director of First Year Studies as soon as possible. In these circumstances it may be possible to arrange discontinuation without failure or to make special examination arrangements.

Professor A.H. Dooley
Head, School of Mathematics and Statistics

UNIVERSITY STATEMENT ON PLAGIARISM

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

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement
 - paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
 - piecing together sections of the work of others into a new whole;
 - presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
 - claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed².

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism. The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

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

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

www.lc.unsw.edu.au/plagiarism

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

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

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

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

²Adapted with kind permission from the University of Melbourne

ALGEBRA SYLLABUS AND LECTURE TIMETABLE

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

The computer package Maple will be used in the algebra course. An introduction to Maple is included in the booklet *Computing Notes for First Year Mathematics Courses 2009*.

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

Chapter 1. Complex Numbers

Lecture 1. Development of number systems and closure. Definition of complex numbers and of complex number addition, subtraction and multiplication. (Sections 1.1, 1.2, start Section 1.3).

Lecture 2. Division, equality, real and imaginary parts, complex conjugates. (Finish 1.3, 1.4).

Lecture 3. Argand diagram, polar form, modulus, argument. (Sections 1.5, 1.6).

Lecture 4. De Moivre's Theorem and Euler's Formula. Arithmetic of polar forms. (Section 1.7, 1.7.1).

Lecture 5. Powers and roots of complex numbers. Binomial theorem and Pascal's triangle. (Sections 1.7.2, 1.7.3, start Section 1.8).

Lecture 6. Trigonometry and geometry. (Finish 1.8, 1.9).

Lecture 7. Complex polynomials. Fundamental theorem of algebra, factorization theorem, factorization of complex polynomials of form $z^n - z_0$, real linear and quadratic factors of real polynomials. (Section 1.10).

Chapter 2. Introduction to Vectors

Lecture 8. Vector quantities and \mathbb{R}^n . (Section 2.1, 2.2).

Lecture 9. \mathbb{R}^2 and analytic geometry. (Section 2.3).

Lecture 10. Points, line segments and lines. Parametric vector equations. Parallel lines. (Section 2.4).

Lecture 11. Planes. Linear combinations and the span of two vectors. Planes through the origin. Parametric vector equations for planes in \mathbb{R}^n . The linear equation form of a plane. (Section 2.5).

Chapter 3. Linear Equations and Matrices

Lecture 12. Introduction to systems of linear equations. Solution of 2×2 and 2×3 systems and geometrical interpretations. (Section 3.1).

Lecture 13. Matrix notation. Elementary row operations. (Sections 3.2, 3.3).

Lecture 14. Solving systems of equations via Gaussian elimination. (Section 3.4)

Lecture 15. Deducing solubility from row-echelon form. Solving systems with indeterminate right hand side. (Section 3.5, 3.6).

Lecture 16. General properties of solutions to $A\mathbf{x} = \mathbf{b}$. (Section 3.7). Matrix operations (start Section 4.1)

Chapter 4. Matrices

Lecture 17. Operations on matrices. Transposes. (Sections 4.1, 4.2).

Lecture 18. Inverses and definition of determinants. (Section 4.3 and start Section 4.4).

Lecture 19. Properties of determinants. (Section 4.4).

Chapter 5. Vector Geometry

Lecture 20. Length, angles and dot product in \mathbb{R}^2 , \mathbb{R}^3 , \mathbb{R}^n . (Sections 5.1,5.2).

Lecture 21. Orthogonality and orthonormal basis, projection of one vector on another. Orthonormal basis vectors. Distance of a point to a line. (Section 5.3).

Lecture 22. Cross product: definition and arithmetic properties, geometric interpretation of cross product as perpendicular vector and area (Section 5.4).

Lecture 23. Scalar triple products, determinants and volumes (Section 5.5). Equations of planes in \mathbb{R}^3 : the parametric vector form, linear equation (Cartesian) form and point-normal form of equations, the geometric interpretations of the forms and conversions from one form to another. Distance of a point to a plane in \mathbb{R}^3 . (Section 5.6).

EXTRA ALGEBRA TOPICS FOR MATH1141

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

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

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

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

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

ALGEBRA PROBLEM SETS

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

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

PROBLEM SCHEDULE

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

For tutorial in week	Try to do up to		Homework Questions
	chapter	problem	
1	1	8	1,5,6,8
2	1	17	12,13,10,21 a-d
3	1	37	27,28,31,33a,34a,37a
4	1	64	40,51,54,60a
5	1	82	61,68b,72
6	2	30	1,17,18,21 + revise for test
7	2	50	31,33b,e,34c,41b,d,46
8	3	15	5,7,10,13b,14c
9	3	43	17,22a,26,27,31
10	4	23	1,7,19,20,23
11	4	53	26,32,33,36 + revise for test
12	5	26	1,8,9,17,20

Problems from 27 on in Chapter 5 will need to be tackled in your own time.

CLASS TESTS AND EXAMS

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

The following table shows the week in which each test will be held and the topics covered.

Test	Week	Topics covered	
		chapter	sections
1	6	1	1.1 to 1.9
2	11	2	All
		3	All

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

CALCULUS SYLLABUS FOR MATH1131 MATHEMATICS 1A

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

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

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

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

CALCULUS SYLLABUS FOR MATH1141 HIGHER MATHEMATICS 1A

This is the syllabus for *Higher Mathematics 1*.

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

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

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

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

PROBLEM SETS

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

PROBLEM SCHEDULE

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

Week	Calculus problems		Homework Problems
	Chapter	Problems up to	
1	1	Revision problems	3(d), 4(i), 6(c), 8(a)
		9	4(e), 7
2	1	19	12, 13(e), 15, 17
3	2	15	1(e), 2(b), 3(b), 5, 12(b), 13(a)
4	3	10 (Test 1)	3, 6, 9(a), 9(c)
5	4	17	2(d), 3, 7(a), 10(c), 10(d), 11(a)
6	5	14	1(b), 3, 4(b), 7(a), 10(b)
7	5	24	15, 18, 19(c), 20(d), 24
	6	7	1, 5
8	6	17 (Test 2)	8(b), 8(d), 8(f), 11(b)
9	7	19	2(b), 3(e), 4(b), 7(c), 8(b)
10	8	18	4(a), 13(a), 13(b), 15(d), 16(d), 18(b), 18(e)
11	8	29	19(c), 19(d), 22(a), 22(b), 24(b)
12	9	11	2(a), 3(b), 4(e), 5(a), 8(c), 9(e), 9(h)

Problems in Chapter 10 will need to be tackled in your own time.

CLASS TESTS AND EXAMS

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

Test 1 Week 4.

Test 2 Week 8.

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

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

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

It is important to note that:

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

SCHEDULE OF ALL CLASS ASSESSMENTS

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

Week	Algebra	Calculus	Computing
1			
2			
3		TP1	
4		Test 1	
5			
Mid-semester break			
6	TP2/Test1		On line test ends
7		TP3	
8		Test 2	
9			Test in Laboratory
10			
11	TP4/Test 2		
12			
End of semester examination — check UNSW exam timetables for details			

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

TP1, TP2, etc denote the weeks when the online tutorial preparation tests are due for completion. The availability of these tests is given on page 10.

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. Students in first year mathematics courses are introduced to the symbolic computing package known as Maple which, while quite new, is influencing the application of mathematics in the real world, as well as how mathematics is taught. Learning to use Maple will enhance your understanding of the mathematics involved in the algebra and calculus sections of this course. Maple also enables you to tackle larger, harder and more realistic mathematical problems as it can handle all the difficult or tedious algebraic manipulations present in the problems. Furthermore, learning some Maple introduces you to some of the basic ideas and structures in computer programming. You will find the skills you acquire and the techniques you learn useful in many other courses you study, both within and outside the School of Mathematics and Statistics.

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

Computing lab

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

How to start

In week 0 you should attend an “Introduction to Computing and Maple” lecture run by the School of Mathematics and Statistics. These lectures will introduce you to the School’s computing facilities and show you how to get started with the computing component of MATH1131/1141.

These lectures will be held at the following times and at the location indicated::

- Monday 1–2pm Physics Theatre
- Tuesday 1–2pm Central Lecture Block 6
- Thursday 1–2pm Central Lecture Block 7
- Friday 10–11am Keith Burrow Theatre and 1-2pm Physics Theatre

Following this lecture, you should go to the Red Centre lab G012 and complete an introductory module. Consultants will be on duty to help you get started with this at the following times in week 0.

- Monday 2–4pm
- Tuesday – Friday between 12am – 4pm

Before you can log on to a PC in the Red Centre labs you must set your lab password. You should do this before you come to the lab for the first time. To do this, follow the “Maths Info” link on the MATH1131/1141 My eLearning homepage and follow the instructions for setting your lab password. Alternatively, you can use one of the lab terminals specially configured to allow you to set your computing lab password.

After week 0, you are expected to master the material in the Computing Notes 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 12am to 4pm each weekday until the end of week 11.

Computing syllabus

The Maple computing component is taught via a series of self-paced modules available in My eLearning Vista. 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. All modules must be completed by 9pm Friday of week 6, but there are internal deadlines for the component quizzes. The timetable for the completion of these small tests is explained in detail in the section on assessment on page 31.

The online teaching package consists of the following modules:

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

Module 1 Basic Maple commands: arithmetic operations, brackets, constants and variables.

Module 2 Functions: expressions, functions, Maple’s inbuilt functions, evaluating a function, piecewise defined functions, simplifying an expression.

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

Module 4 Complex Numbers and equations: complex numbers, solving equations exactly and approximately.

Module 5 Plotting: introduction to plotting, parametric plots, implicitly defined functions, plotting data points.

Module 6 Collections of Expressions: sets and lists, vectors and matrices, selecting components, applying procedures.

Module 7 Linear Algebra: basic operations on vectors and matrices, creating vectors and matrices, vector and matrix arithmetic, matrix algebra, Gaussian elimination.

Using other computers

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

WARNINGS

Misuse of computers is treated as Academic Misconduct and is a serious offence. Guidelines for acceptable conduct are in the Computing Notes.

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 PC — don't waste your time and other people's. Problems with your own (home) computer, internet service or the UNSW IT systems are not considered to be an excuse for missing tests or test deadlines. So you should PLAN AHEAD and not leave things until the last minute.

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

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

Assessment

There will be two different forms of computing tests. An initial set of seven small tests will be run using Maple TA, a web based software application for online learning, teaching and assessment. Direct access to Maple TA is via the link

<http://mapleta.elearning.unsw.edu.au/mapleta>

where the login is zSTUDENTNO and the password is your mathematics computing lab password. These tests may be completed on any suitable web browser in your own time, but as the Maple package will be needed to answer the questions, the School computing labs are probably the best place to attempt the tests. These online Maple computing tests are linked to the self-paced Maple instruction modules in My eLearning. Details on using Maple TA for these tests are in the file "Using Maple TA" in the Assessment folder under Course Materials in the MATH1131 or MATH1141 module on My eLearning. These on line Maple computing tests will be available (almost) continuously, as they must be completed in sequence, but to gain marks for the computing component of the course the tests must be completed before the deadlines indicated below.

Tests	Due
1, 2, 3 and 4	5pm Friday 3/4/2009
5, 6 and 7	5pm Friday 24/4/2009

The second form of computing test will be run under exam conditions in the School's laboratories. You must book for the test through the School's Student Web Portal, accessible via the Maths Info link on the course page on My eLearning, and bring your UNSW Student ID card to the test.

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

Due Dates

The online Maple computing tests have deadlines of 5pm Friday of week 4 for the first 4 quizzes and 5pm Friday of week 6 for the remaining quizzes.

The laboratory test will be held at various times in week 9 (booking available from week 7).

Because the computing tests can be sat at many different times, medical, or other, reasons for missing the test will generally not be accepted. For this reason you are advised to choose an early time to sit the test. If you consider that you have an exceptional reason for missing the test then you must speak to Dr Kress or Dr Blennerhassett at your earliest convenience after the tests have been completed. Tutors do not have permission to accept medicals for the computing test.

Jonathan Kress (Room 4102)
Lecturer in Charge
First Year Computing

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

MATH1131/MATH1141 LABORATORY TEST

Tests will be held in the Red-Centre computer lab G012 at various times during Week 9. You must make a booking to do the test at one of these times. Bookings must be made through the School of Mathematics and Statistics' Student Web Portal ("Maths Info" link on My eLearning). This should be available after week 7 of semester. When you have logged on, follow the appropriate link to get instructions about how to make a booking. If you believe that all the proposed times will be impossible for you, inform the First Year Office immediately.

The test will be on the features of Maple which are covered in Chapter 1 and sections 2.1 to 2.10 and 2.12 of the Computing Notes.

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

For each problem on the problem sheet, we have provided an answer which shows you what the final Maple output should be, but not the commands which you might use to get that answer. If you have difficulty doing one of these problems, ask for help from one of the computing consultants in the labs. **If your Maple worksheet crashes while you are working on the practice problems, please make a note of what you were doing at the time and inform one of the computing consultants.**

Note that **you will NOT be awarded any marks for a correct numerical or formula answer without appropriate Maple commands to generate that answer.** For example, if you are asked to differentiate x^2 , the answer $2x$ will not get any marks unless it has been generated by an appropriate differentiation command. **Everything that can be done by a Maple typed command must be done by a Maple typed command.** For example, if you are asked to find the largest member of a set of integers then you must use a Maple command to find it — there will be no marks for looking at the set and picking out the largest member yourself. You must **never read a numerical value from one of Maple's output lines and type it back in as input to a later command.**

You will need to save your Maple worksheet before the end of the test, following the instructions on the test paper. However, you must **tidy up your worksheet as you go** by deleting mistakes and unsuccessful attempts, so that the worksheet you submit shows only your final attempt at each question. **Make sure that you know how to go back and change a wrong command, how to insert a new input line among existing input lines and how to delete unwanted lines.** Practise doing these things when working through the practice problems.

Also attached is a sample test. Try to do it in 40 minutes AFTER you have worked through all the practice problems

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

PRACTICE PROBLEMS MATH1131/1141

All answers must be EXACT, unless the question asks for a certain number of significant figures.

- Find $\lim_{x \rightarrow 0} (1+x)^{1/x}$. *Answer: e.*
- Find $\lim_{x \rightarrow 0^+} \tan^{-1} \left(\frac{\ln x}{x} \right)$. *Answer: $-\frac{1}{2}\pi$.*
- Differentiate $\tan^{-1} \left(\frac{1+e^x}{\cos \pi x} \right)$ and apply the command `simplify` to your answer. *Answer: $\frac{e^x \cos(\pi x) + \sin(\pi x) \pi + \sin(\pi x) \pi e^x}{\cos(\pi x)^2 + 1 + 2e^x + e^{2x}}$*
- Using only one Maple command, find the third derivative $f'''(x)$ for $f(x) = x^2(1+x^2)\sin^{-1}(x)$. Use a Maple command bring the terms in your answer to a common denominator.

$$\text{Answer: } \frac{24x \arcsin(x) (1-x^2)^{5/2} + 6 + 31x^2 - 57x^4 + 26x^6}{(1-x^2)^{5/2}}$$

- Let $f(x) = x \cos ax$.

(i) Find the fourth derivative $f^{(4)}(x)$. *Answer: $4 \sin(ax)a^3 + x \cos(ax)a^4$.*

(ii) Evaluate $f^{(4)}(x)$ for $x = \pi/2$ and $a = 1/3$ and simplify your answer.

$$\text{Answer: } \frac{2}{27} + \frac{1}{324}\pi\sqrt{3}.$$

- From the definition** of the derivative, find the derivative at $x = 1$ for $f(x) = \frac{x \tan^{-1} x}{1+x^2}$.

$$\text{Answer: } \frac{1}{4}.$$

- Enter into Maple the following equations.

$$\text{eq1 : } x^4 + (x-1)^2(y-1)^2 + y^4 = 1,$$

$$\text{eq2 : } \sec \left(\frac{x^2}{1+x^2} \right) + x^2(y-2)^2 + \operatorname{cosec} \left(\frac{1}{1+y^2} \right) = 3.$$

(i) Find dy/dx in terms of x and y if x and y satisfy *eq1*.

$$\text{Answer: } -\frac{2x^3 + xy^2 - 2xy + x - y^2 + 2y - 1}{x^2y - x^2 - 2xy + 2x + y - 1 + 2y^3}.$$

(ii) Plot on **one diagram** the whole of the curve defined by *eq1* and the whole of the curve defined by *eq2*, with the **same scale on the two axes** of the diagram. Take care to **ensure that the ranges you set for plotting fit closely to the actual extent of the curves** - this may require more than one attempt. (If you don't do this, you are likely to get an inaccurate plot because Maple's plotting procedure uses a grid containing a fixed number of points (by default, 625) spread evenly over the ranges that you specify. If you set ranges which are much too large, most of the grid points will be wasted and there will be too few points in the region actually occupied by the given curves.)

8. Using ONLY Maple, find all real values of a and b such that the function

$$f(x) = \begin{cases} x^2 & \text{for } x \leq 1 \\ e^{ax+b} & \text{for } x > 1 \end{cases}$$

is (i) continuous at $x = 1$, (ii) differentiable at $x = 1$.

Answer: (i) $a = -b$, (ii) $a = 2, b = -2$.

9. Evaluate $\int \frac{2}{1 + \cos 2t} dt$. *Answer:* $\tan(t)$.

10. Evaluate $\int_1^2 \frac{\sin \pi x^2}{\sqrt{1+x^2}} dt$ to 5 significant figures. *Answer:* $-.13897$.

11. Find $\int_{-\infty}^{\infty} e^{-x^2} dx$. *Answer:* $\sqrt{\pi}$.

12. Use one Maple command to create the expression f defined by the formula

$$\begin{cases} 2x & \text{if } x < 1, \\ \operatorname{cosec}(\pi x/6) & \text{if } 1 \leq x \leq 3, \\ (x-2)^2 & \text{if } x > 3. \end{cases}$$

(i) Plot the graph of f over the interval $[0, 4]$.

(ii) Evaluate (exactly) the integral of f over the interval $[0, 4]$.

$$\text{Answer: } \frac{29 \ln(2 + \sqrt{3}) + 5\pi}{3\pi}.$$

13. Find the real and imaginary parts of $e^{7\pi i/12}$. Apply `convert(%, radical)` to your answer to express it in terms of surds.

$$\text{Answer: } -\frac{1}{4}\sqrt{6}\left(1 - \frac{1}{3}\sqrt{3}\right), \quad \frac{1}{4}\sqrt{6}\left(1 + \frac{1}{3}\sqrt{3}\right).$$

14. Find $|z|$ and $\operatorname{Arg}(z)$ for $z = 1 + i\sqrt{5 - 2\sqrt{5}}$. *Answer:* $\sqrt{5} - 1, \frac{1}{5}\pi$.

15. Find (exactly) the modulus and argument of $(1+i)^i$. Apply the command `simplify` to the modulus. *Answer:* $e^{(-\frac{1}{4}\pi)}, \frac{1}{2}\ln(2)$.

16. Use a single Maple command to find the minimum value of $x^5 - 5x^4 - x^3 + 1$ on the interval $[0, 6]$ and simplify your answer. Also find the maximum value over this interval.

$$\text{Answer: } -\frac{804}{5} - \frac{1886}{125}\sqrt{115}, 1081.$$

17. Use the **sum** command to enter into Maple the polynomial

$$p(z) = 6 - 5z + 4z^2 - 3z^3 + 2z^4 - z^5.$$

(i) Evaluate, to 5 significant figures, all five roots of p .

$$\text{Answer: } 1.4918, -.55169 + 1.2533 I, -.55169 - 1.2533 I, .80579 + 1.2229 I, .80579 - 1.2229 I.$$

(ii) Use just one command line to evaluate, in radians to 5 significant figures, the arguments of the five roots of p .

$$\text{Answer: } [0., 1.9855, -1.9855, .98818, -.98818]$$

- (iii) Convert the values of the arguments to degrees (your answer must be expressed in degrees and not shown as $\frac{\text{degrees}}{\pi}$).
Answer: [0, 113.76 degrees, -113.76 degrees, 56.618 degrees, -56.618 degrees]

[Note that in all three parts of this question the terms in your result may appear in a different order from the one shown here.]

18. Using **only one** Maple command, find, to 10 significant figures, the unique solution to $\sin t = \sin 5t$ with $5 \leq t \leq 6$. *Answer:* 5.759586532.
19. Find, to 5 significant figures, the unique turning point of $f(x) = \frac{x \cos(x^2)}{1 + x^2}$ in the interval (4,4.5) and determine, to 5 significant figures, the value of $f''(x)$ at that point. *Answer:* 4.3389, -16.465.
20. Find, to 5 significant figures, the points in the intervals [0, 1] and [3, 4] at which the curves $y = \cos x$ and $y = x \sin x$ intersect. Also find, to 5 significant figures, the area enclosed by the curves between these two points of intersection.
Answer: The points are .86033 and 3.4256. The area is 3.8495.
21. Find, to 10 significant figures, all points of intersection of the curves $y = e^x \cos 3x$ and $y = \tan(x/3)$ in the interval [0, 3] and label them t_1, t_2, \dots, t_n . Then find, to 10 significant figures, the area between the curves over the interval $[t_1, t_n]$.
Answer: $t_1 := .4898913896$, $t_2 := 1.610523518$, $t_3 := 2.588700591$,
area := 7.039898942.
22. For the curves $x^2 + 4y^2 = 1$ and $4(x - 1)^2 + (y - 2)^2 = 5$,
- find, to 10 significant figures, the coordinates for one of the points where the curves intersect and
 - find the second point of intersection by plotting the curves to find the approximate location and then solving with a constraint on the value of x .
- Answer:* $\{x = .8923443205, y = -.2256776538\}$,
 $\{x = .1743223462, y = .4923443205\}$
23. Find i) $\sum_{n=1}^{100} \sin\left(n^2 \frac{\pi}{2}\right)$, ii) $\prod_{k=1}^{\infty} \frac{k(k+1)}{\left(k + \frac{1}{2}\right)^2}$. *Answer:* i) 50, ii) $\frac{1}{4}\pi$.
24. Find $\lim_{k \rightarrow \infty} \sum_{n=1}^k \frac{n}{n^2 + k^2}$ and apply **evalc** to your answer. *Answer:* $\frac{1}{2} \ln(2)$.
25. Without using the Riemann sum facility in the **student** package, set up a summation expression S_n for the lower Riemann sum for the function x^2 over the interval [0, 1] using the partition $P_n = 0, \frac{1}{n}, \frac{2}{n}, \dots, 1$ and find the limit of S_n as $n \rightarrow \infty$. *Answer:* $\frac{1}{3}$.
26. The Fourier cosine expansion for a function f on the interval [0, 1] is

$$a_0 + \sum_{k=1}^{\infty} a_k \cos(k\pi x),$$

where

$$a_0 = \int_0^1 f(x) dx$$

$$a_k = 2 \int_0^1 f(x) \cos(k\pi x) dx \quad \text{for } k = 1, 2, 3, \dots$$

For the function $f(x) = x^2$ at $x = 1/2$, find the exact value of the error in using the sum of the first 20 terms in the Fourier cosine expansion as an approximation to $f(x)$.

Answer: $\frac{1}{12} - \frac{5257891}{6350400} \frac{1}{\pi^2}$

27. Let $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 6 & 5 \\ 1 & 0 & 5 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$.

(i) Evaluate $A\mathbf{b}$. *Answer:* $[14, 29, 16]$.

(ii) Create the augmented matrix $(A|\mathbf{b})$. Use Maple's `RowOperation` command to reduce the augmented matrix to echelon form. Then do back-substitution to find the solution to $A\mathbf{x} = \mathbf{b}$.

Answer: $[-7, 1, 2]$

(iii) Use a Maple command to create from A a matrix M which is the 2×2 submatrix in the top righthand corner of A . Then solve $M\mathbf{x} = \mathbf{c}$. (To create M , do NOT read off entries from A and enter them one by one into a new matrix.) *Answer:* $\left[-\frac{5}{8}, \frac{7}{4}\right]$.

28. Enter the matrices $A = \begin{pmatrix} 1 & 10 & 0 & 0 \\ 2 & 11 & 2 & 1 \\ 3 & 5 & 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 & 3 \\ -4 & -4 & 4 \\ 5 & 8 & -11 \end{pmatrix}$ into Maple and use

Maple commands to do the following things.

(i) Change the entry 5 in A to 4.

(ii) *From the modified A produced in part (i)*, use Maple operations to create a matrix C consisting of columns 1,3 and 4 of A and to create a vector \mathbf{v} which is column 2 of A .

(iii) Solve $CB\mathbf{x} = \mathbf{v}$. *Answer:* $[2, -3, 1]$.

29. Enter the matrix

$$M = \begin{pmatrix} \cos t & -\sin t \\ \sin t & \cos t \end{pmatrix}$$

into Maple. Then evaluate it exactly (in terms of surds) at $t = \pi/5$ (you will need to use `convert(...,radical)`.) Finally, evaluate M to 5 significant figures at $t = \pi/7$.

Answer: $\begin{bmatrix} \frac{1}{4}\sqrt{5} + \frac{1}{4} & -\frac{1}{4}\sqrt{2}\sqrt{5-\sqrt{5}} \\ \frac{1}{4}\sqrt{2}\sqrt{5-\sqrt{5}} & \frac{1}{4}\sqrt{5} + \frac{1}{4} \end{bmatrix}, \begin{bmatrix} .90096 & -.43389 \\ .43389 & .90096 \end{bmatrix}$.

30. The state of a system at time t is described by a vector \mathbf{p} in \mathbb{R}^n . Given an expression for \mathbf{p} as a function of t , what single Maple command line would you use to find the vector expression for the rate of change of the rate of change of the system? Try your command on an example to check that it works.

UNIVERSITY OF NEW SOUTH WALES
SCHOOL OF MATHEMATICS AND STATISTICS

MATH1131/MATH1141 COMPUTING TEST

SESSION 1, 2009

SAMPLE VERSION A

INSTRUCTIONS

- **No calculators, pens, paper or writing materials of any kind are permitted**, but you will be provided with a copy of the Computing Notes.
- Start up a Maple session and open the worksheet `test.mw` using the Open option on the File menu or the Open Worksheet Icon. This worksheet has been prepared with comments separating it into sections for each question. You will then be able to save your session just by clicking on the save icon. **Do not** change the input mode from “Text” to “Math”.
- In case your Maple session crashes, you should **frequently save your work** during the test, **by clicking on the save icon**.
- You may attempt the questions in any order, but each question must be attempted at only one place in the record of your session, NOT in a number of places interspersed with attempts at other questions. Work which is not labelled with the appropriate question number may not be marked.
- You will not be awarded any marks for a correct numerical or formula answer unless you have used **appropriate typed Maple commands** to generate that answer. Everything that *can* be done by means of typed Maple commands *must* be done by means of typed Maple commands. In particular, do NOT read numerical values from output lines and type them back in as input, cut-and-paste output to input or use the graphical user interface features to produce output.
- **All answers should be EXACT**, unless the question asks you to find the answer to a certain number of significant figures.
- You must **tidy up your session** as you go by deleting mistakes and unsuccessful attempts, so that the session you submit shows only your final attempt at each question.
- **BEFORE THE END OF THE TEST** you must **print your session to a file** with the following steps.
 - i) **Open** the Print window *either* by clicking on the printer icon in the tool bar of the Maple window *or* by selecting Print from the File menu.
 - ii) **Tick** the “Print to File” box.
 - iii) Click on the Print button at the bottom of the Print window.
 - iv) **Click** on the OK button in the **Print to File** window

You do NOT have to enter a file name or any other details in the Print to File window.

- Open the the file manager by clicking on the “home” icon (pictured to the right) and then click on the file “out.ps”. This will open the printed version of your worksheet that will be marked. Check that this looks correct and is no more than 10 pages. **Only the first 10 printed pages will be marked.**
- At the end of the test you must **leave this test paper and the copy of the First Year Computing Notes behind.**



The test questions are on the back of this sheet.

Time allowed: 40 minutes

1. (2 marks)

Find $\lim_{x \rightarrow 0} \frac{\frac{\pi}{2} - \cos^{-1}(2x)}{x \cos(x)}$.

2. (3 marks)

Find, to 5 significant figures, the unique turning point of $f(x) = \sin(\sqrt{x}) + \cos(\sqrt[3]{x})$ in the interval $[60, 70]$ and find, to 5 significant figures, the value of $f''(x)$ at the turning point.

3. (3 marks)

Evaluate, to 5 significant figures, all five roots of the polynomial

$$p(z) = z^5 + 5z^3 + 5z + 1$$

and evaluate, in radians to 5 significant figures, the arguments of all the roots.

4. (3 marks)

Let $A = \begin{pmatrix} 1 & 3 & -2 \\ -2 & -8 & 6 \\ 3 & 11 & -7 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 4 \\ -6 \\ 2 \end{pmatrix}$.

Enter the augmented matrix for the system $A\mathbf{x} = \mathbf{b}$. Use MAPLE's row operation and backsubstitution commands to reduce the augmented matrix to row echelon form and find the solution to the system. Do NOT use `GaussianElimination`, `ReducedRowEchelonForm`, `Pivot` or `LinearSolve`.

5. (3 marks)

Find, to 10 significant figures, the coordinates of the two points of intersection of the curves

$$(x - 1)^2 + 2y^2 = 2 \quad \text{and} \quad \tan^{-1} xy = x + y.$$

The actual test questions will add up to 13.

One mark will be awarded in the test for any one correct relevant Maple command.

One mark will be awarded in the test for creating the file `out.ps`

LEAVE THE TEST PAPER BEHIND WHEN YOU ARE FINISHED

STUDENT-OWNED COMPUTERS FOR MATHEMATICS COURSES

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

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

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

SOME GREEK CHARACTERS

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

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