

The University of New South Wales

**MATH1151 Mathematics for Actuarial Studies
and Finance 1A**

INFORMATION BOOKLET

School of Mathematics and Statistics

Semester 1 2009

CONTENTS OF THE MATH1151 COURSE PACK 2009

Your course pack should contain the following five items:

1. *Information Booklet*

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

2. *Algebra Notes (for MATH1151)*

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

4. *Calculus Problems*

Problems, answers, past class tests, table of integrals

5. *Past Exam Papers Booklet*

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GENERAL INFORMATION FOR MATH1151

Background

MATH1151, Mathematics for Actuarial Studies and Finance 1A, is a first year course taught by the School of Mathematics in semester 1, and is worth six units of credit. Students, who pass MATH1151 in semester 1, continue to study MATH1251, Mathematics for Actuarial Studies and Finance 1B, in semester 2.

MATH1151 is a demanding course and the assumed knowledge for the course is the equivalent of a combined mark of about 140 on the NSW HSC Mathematics Extension 1 course.

MATH1131 and MATH1231 (Mathematics 1A and 1B) or their higher versions, MATH1141 and MATH1241, generally satisfy the requirements of the actuarial studies and the mathematics and finance plans and should be considered by students with weaker mathematics backgrounds. However, such students should seek advice before changing, or trying to change, their enrolments.

The excluded courses for MATH1151 are MATH1011, MATH1031, MATH1131, MATH1141, ECON1202 and ECON2291.

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. MATH1131 might be an appropriate substitute course for students who do not have this background: seek advice.

Aims

The aim of MATH1151 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 MATH1251 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. The syllabus includes a computing component, based on the software package MATLAB. The computer-based tutorial problems and assignments define the level of proficiency you are expected to achieve in using MATLAB.

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 computing package MATLAB 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 MATH1151 Course Pack.

Teaching Strategies

MATH1151 is 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.

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.

Lectures

There are two algebra lectures and two calculus lectures per week.

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures	9–10 Alg Biomed-C Du				9–10 Calc Biomed-C Tran
	10–11 Calc Biomed-C Tran				10–11 Alg Biomed-C Du

The lecturers for MATH1151 are:

Algebra A/Prof Jie Du, Room 4104, Red Centre, phone 9385 7084.

Calculus Dr Thanh Tran, Room 2081, Red Centre, phone 9385 7041.

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 MATH1151 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.

Week 0

Week 0 is an integral part of the teaching semester and within MATH1151 is used to introduce students to the computing facilities and electronic resources available for the course. There is one introduction to computing lecture for MATH1151 students focusing on MATLAB, but there are several other computing lectures or demonstration sessions, for MATH1131 and MATH1141 students, 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 MATH1151 page on My eLearning (see page 7) and more information on the computing component in MATH1151 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).

The student society ASOC has provided peer support for students in MATH1151 and the School of Mathematics and Statistics will continue to support this ASOC program.

Course Materials

The course materials for MATH1151 are:

MATH1151 *Course Pack 2009*.

Computing Notes For First Year Mathematics for Actuarial Studies and Finance 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 (for MATH1151)*
- *Calculus Lecture Notes (for MATH1131/1141);*
- *Calculus Problems Booklet;*
- *Past Exam Papers Booklet.*

For the computing component of the course you should consider buying the student edition of MATLAB (Matlab + Simulink + Symbolic Tool box) through the UNSW bookshop. Although expensive, approximately \$166, this is a good price, and MATLAB will be useful in your later undergraduate studies. The book

R. Pratap, *Getting Started with MATLAB Version 6*, Oxford University Press, 2002 is available on short-term loan from RC-3072.

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 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. Problems for Calculus are in a separate booklet in the Course Pack. There are also extra calculus problems at the end of each chapter of the MATH1131 and MATH1141 Calculus Notes if you want more practice!

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 MATH1151. 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 for Actuarial Studies and Finance courses 2009*. These computing notes are freely available from the MATH1151 module on My eLearning, and also on the machines in the computing laboratories. **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%
On-line Algebra and Calculus tests	4%
On-line Computing test (Matlab)	4%
Laboratory Computing test (Matlab)	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 MATH1151 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 MATH1151 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 is given below.

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

Detailed information on how to use the online testing system is available from the MATH1151 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 MATH1151 is between 7 and 8 out of 10. Past experience is that students are likely to have difficulty passing this course if their average test mark is less than 6. If you find that your average after the first two tests is less than 6, you should talk to your tutors about your situation and what you can do about it.

Graduate Attributes

MATH1151 will provide you with an in-depth knowledge of topics in Calculus and Linear Algebra and show applications in interdisciplinary contexts through lectures and exercises. It will enhance your skills in analytical critical thinking and problem solving through illustrative examples in lectures and problem based tutorials. The course will also engage you in independent and reflective learning through your independent mastery of tutorial problems and MATLAB. The mathematical problem solving skills that you will develop are generic problem solving skills, which are based on logical arguments, that can be applied in multidisciplinary work. You will 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 12.

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 14. 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.

Relationship with Higher Mathematics 1

MATH1151 and MATH1251 are courses that were offered for the first time in the year 2000. In previous years, students from your degree program have instead taken MATH1141 and MATH1241 Higher Mathematics 1. Approximately 75% of the content of MATH1151 is the same as for MATH1141, but the order in which some common topics are covered is different. Note that the computing in MATH1151 is based on MATLAB whereas in MATH1141 it is based on Maple.

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 MATH1151. If they cannot help you, try your lecturers (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

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 MATH1151 is based on the MATH1151 Algebra Notes, which are essential reading and must be brought to all algebra 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 (4 hours)

Vectors and brief mention of matrices, vector addition and scalar multiplication, vectors in \mathbb{R}^n , parametric vector and Cartesian equations of lines, parametric vector equations of planes, Cartesian equations of planes in \mathbb{R}^3 , applications.

Chapter 2. Linear Equations and Matrices (4 hours)

Systems of linear equations, matrix notation, elementary row operations, Gaussian elimination, row echelon form and solvability, general properties of solutions to $A\mathbf{x} = \mathbf{b}$, applications.

Chapter 3. Matrices (3 hours)

Matrix operations, transposes, inverses, determinants, applications.

Chapter 4. Vector geometry (4 hours)

Length and distance, angle and the dot product, projections, orthogonality, orthonormal expansions, the cross product, scalar triple products, determinants and volumes, point-normal equations of planes in \mathbb{R}^3 , projections and least-squares approximations.

Chapter 5. Probability and statistics (8 hours)

Axiomatic probability, conditional probability, Bayes rule, independent events, discrete random variables (uniform, binomial, Poisson, geometric), mean and variance of discrete random variable, continuous random variables (uniform, negative exponential), cumulative distribution functions, mean and variance, normal distributions, sums and means of random variables, the Central Limit theorem, approximations to the binomial distribution by the normal distribution and the Poisson distribution.

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.

There are a number of questions marked [M], indicating that MATLAB 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. Tutors may need to vary a little from this suggested problem schedule.

For tutorial in week	Try to do up to	
	chapter	problem
1	1	14
2	1	30
3	1	50
4	2	20
5	2	45
6	3	31
7	3	55
	4	15
8	4	31
9	4	43
10	5	30
11	5	45
12	5	63

Problems from 64 on in Chapter 5 will need to be tackled in your own time.

CLASS TESTS AND EXAMS

Questions for the class tests in MATH1151 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	All
		2	2.1 to 2.4
2	11	2	2.5 to 2.8
		3	All
		4	All

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

CALCULUS SYLLABUS FOR 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 $x \rightarrow \infty$, informal definitions of limits at finite points, the Pinching Principle, continuity and types of discontinuity, 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, Bolzano's Theorem, 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 (5 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 Estimation.

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

The problems in the MATH1151 Calculus Problems booklet 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.

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 shows the calculus problems which are relevant to each week's calculus tutorial. You should work on them at home or in the library between classes. Some of them will be worked through and discussed in the tutorials. Tutors may need to vary a little from this suggested problem schedule.

Week	Calculus problems	Week	Calculus problems
1	1–31	7	93–122
2	32–37	8	123–139 (Test 2)
3	38–42	9	140–145
4	43–61 (Test 1)	10	146–157
5	62–77	11	158–163
6	78–92	12	164–170

Problems from 171 on will need be tackled in your own time.

CLASS TESTS AND EXAMS

The tests will cover sections of the syllabus as shown in the table below. The table also shows which problems are relevant to each test.

Test	Syllabus sections	Standard problems in ranges
1	1.	1–37
2	2.	38–77
	3.	78–112

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, on-line 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 problems 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 9.

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. 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.

How much?

In MATH1151 there will be two tests worth a total of 12% of your final mark, and there will be exam questions worth about another 3% of the final mark. The Computing component depends on the other components and will require a knowledge of the appropriate Algebra and Calculus.

Aim

The aim of the Computing component is twofold.

- 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. Also, 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.
- Secondly, you gain some familiarity with Linux, an operating system used widely in scientific computing.

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 Matlab” lecture run by the School of Mathematics and Statistics. This lecture will introduce you to the School’s computing facilities and show you how to get started with the computing component of MATH1151. The lecture is scheduled for

- Wednesday 2–3pm in the Physics Theatre.

If you miss this lecture you may like to attend one of the lectures for our other first year courses, but in these the software package introduced will be Maple rather than Matlab. 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 the introductory 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 MATH1151 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 Matlab 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.

Using other computers

MATLAB is available for PCs and a home computer copy of MATLAB may well be of great use to you throughout your studies at university. However it is not necessary for you to buy MATLAB at any stage to complete any of your mathematics courses at UNSW.

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 numerous 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 editors available such as `kwrite`, `xedit`, `emacs` or `kate`.

Limited help will be available from the consultants who will be available in Room G012 from 12am to 4pm each day. These consultants may have little or no knowledge of MATLAB, so you should only expect them to assist with UNIX/X-windows difficulties.

You will be able to book time on the terminals. Details for this are in the Computing Notes and available on the system. Probably you will be able to book for an average of 1 hour per week, but this is course to change depending on the load on the terminals. You can, however, use the terminals at any time that they are not booked by someone else. At certain times, some of the terminals will be booked for later-year classes.

If you have any constructive criticism or comment about the Computing component then please let us know by email to w.mclean@unsw.edu.au.

Maple

The other first-year mathematics courses use a different software package called Maple. However, the Actuarial Studies Unit advised us that MATLAB was 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, but it is available on the laboratory PCs and you are free to use it.

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 MATH1151, 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 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 MATLAB or 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 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 others to do your test.

Assessment

There will be two different forms of computing tests. The initial one will be run using My eLearning Vista, a web based software application for on line learning and teaching. This test may be completed on any suitable web browser in your own time. The second form of computing test will be run under exam conditions in the School's laboratories.

The on-line My eLearning Vista tests are designed to get you used to using Matlab for simple problems and will test your knowledge of Matlab syntax. The tests are part of a self paced introduction to Matlab. You have an unlimited number of attempts of each test and there is no time limit on each individual test. The instruction package contains 9 modules, but MATH1151 students need to complete only 6 modules (or up to and including test 5). Test 5 must be completed by the end of week 6. Details will be available though the My eLearning Vista page for your course, available either though myUNSW or directly at

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

The laboratory test will be run under exam conditions (see following pages). 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 on line My eLearning Vista test is due by **9pm on Friday of week 6**.

The laboratory test will be held at various times in **week 9**, with 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 McLean 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.

Dr Bill McLean (Room 2085)
Lecturer in Charge
MATH1151 Computing

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

MATLAB Computing Exercises and Practice Tests
School of Mathematics and Statistics
University of New South Wales

MATH1151
Mathematics for Actuarial Studies and Finance 1A
MATLAB Computing Exercises – 2009

The purpose of this handout is to help you prepare for the MATLAB Computing Test. From the MATH1151 course web page, you can download model solutions to all the exercises below.

You are expected to be familiar with the following MATLAB commands:

[]	create arrays
:	colon operator
.*	element by element multiplication
./	element by element division
.^	element by element power
sum	sum
prod	product
max	maximum
min	minimum
rref	reduced row echelon form
\	matrix left-division operator
disp	display a text message
format	change the format of screen output
eps	relative machine precision
inline	create an inline function
fzero	finds zero(s) of a function
fminbnd	finds a local minimum of a function
ezplot	easy-to-use plotting command
fplot	plots a function
plot	plots data points
grid	put gridlines on a plot
polar	polar plot
linspace	linearly spaced points
help	MATLAB's on-line help function
print -dps	save plot as postscript file

For the test, you also need to understand how to create and modify M-files using the MATLAB editor, and how to use the `history` file.

The harder exercises are marked with an asterisk. Each test will contain four routine questions and one harder one.

Exercises

1. Enter the following three vectors \mathbf{a} , \mathbf{b} and \mathbf{c} , and evaluate the vector algebra expressions $2\mathbf{a} + 13\mathbf{b}$ and $12\mathbf{a} - 4\mathbf{c}$, if they exist:

$$\mathbf{a} = [1, 2, 3, 4, \dots, 11], \quad \mathbf{b} = [1, 3, 5, 7, \dots, 21], \quad \mathbf{c} = [1, 4, 9, 16, 25, \dots, 100].$$

2. Evaluate the sum

$$\sum_{n=1}^{100} \frac{1}{n\sqrt{n}} = 1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \dots + \frac{1}{100\sqrt{100}}.$$

3. Evaluate the product

$$\prod_{n=1}^{100} \frac{(2n)^2}{(2n-1)(2n+1)} = \frac{(2)(2)}{(1)(3)} \times \frac{(4)(4)}{(3)(5)} \times \frac{(6)(6)}{(5)(7)} \times \dots \times \frac{(200)(200)}{(199)(201)}.$$

4. Find the largest number in the infinite sequence a_1, a_2, a_3, \dots if

$$a_n = \frac{n^5}{2^n}.$$

5. Define the coefficient matrix A and the right-hand-side vector \mathbf{b} for the linear system

$$\begin{aligned} 4x_1 - x_2 + 3x_3 + 2x_4 &= 3, \\ &+ 3x_2 \quad \quad \quad + 4x_4 = -4, \\ -3x_1 \quad \quad \quad + 2x_3 + 3x_4 &= 2, \\ 18x_1 + 3x_2 + 5x_3 + 8x_4 &= 3. \end{aligned}$$

Set up the augmented matrix $[A \mid b]$, calculate the reduced row-echelon form R and display the appropriate message: **Linear systems has no solutions**, **Linear system has a unique solution**, **Linear system has infinitely many solutions**. (Decide which case is appropriate just by looking at R . You are **not** asked to find a solution.)

6. Solve the linear system

$$\begin{aligned} 3x_1 \quad \quad \quad - x_3 + 2x_4 + x_5 &= 8, \\ &4x_2 + 2x_3 \quad \quad \quad - x_5 = -15, \\ x_1 \quad \quad \quad + 2x_3 + x_4 &= 4, \\ &2x_2 - x_3 + 4x_4 &= 1, \\ -x_1 + x_2 \quad \quad \quad + 7x_5 &= 32. \end{aligned}$$

Then calculate the residual vector $A\mathbf{x} - \mathbf{b}$ and check if it zero.

7. Create a plot of the polynomial $x^5 - 9x^3 + 2x - 4$ for $-3 \leq x \leq 3$.

8. Create a plot of the parametric curve

$$\left. \begin{aligned} x &= \sin\left(2t + \frac{\pi}{4}\right) \\ y &= \frac{t^2}{3} - t \end{aligned} \right\} \text{ for } -\frac{\pi}{2} \leq t \leq \pi,$$

put gridlines on the plot and then save the plot in a PostScript file `myplot.ps` (using `print`).

9. Create a plot of the polar curve

$$r = 5 - 4 \cos(2\theta) \quad \text{for } -\pi \leq \theta \leq \pi,$$

and then save the plot in a PostScript file `myplot.ps` (using `print`).

10. * Find all real solutions of the nonlinear equation

$$x^3 = \cos x + 2.$$

Your answer(s) should be correct to machine precision.

11. * The function

$$f : x \mapsto e^{-x^2} \sin\left(8x - \frac{\pi}{3}\right),$$

has a global minimum at a unique point x_{\min} and a global maximum at a unique point x_{\max} . Find x_{\min} and x_{\max} , correct to at least 5 significant figures.

MATH1151 SESSION 1 2009
MATLAB COMPUTING TEST
SAMPLE VERSION

Student name	Student number
--------------	----------------

-
- Students may **not** bring any materials to the test except for some writing paper and a pen or pencil for rough working. Any rough working and notes must be handed in at the end of the test.
 - You may attempt the questions in any order, but you must create five files called `q1.m`, `q2.m`, `q3.m`, `q4.m`, `q5.m` containing your answers to questions 1, 2, 3, 4, 5 respectively. Each file must be a script M-file. Any other files that are needed (for example function files) must also be saved under the names `f1.m`, `f2.m` . . . etc. Files with any other names will **not be considered**. You must use small (lower case) letters as a file `Q1.m` will **not** be processed.
 - Your calculus tutor will mark each question based on a hard copy of your M-file and of the output it produces **after the workspace has been cleared**. For example, to test your answer to the first question you should type `clear all` followed by `q1` in the MATLAB command window.
 - The test may include one question that requires you to create a postscript file called `myplot.ps`. In this case, type `gv myplot.ps` at the Linux prompt to see what the marker will see when marking the question.
 - Make sure you **SAVE YOUR WORK REGULARLY**
 - Use semi-colons to suppress **unnecessary** output. Excessively long output may be penalised.
 - You may use MATLAB's on-line help facilities.

The test questions are on the back of this sheet.

SAMPLE VERSION

Time allowed: **45 minutes**.

Use semi-colons where appropriate.

1. Enter the following three vectors \mathbf{a} , \mathbf{b} and \mathbf{c} , and evaluate the vector algebra expressions $2\mathbf{a} - 3\mathbf{b}$ and $7\mathbf{a} - 4\mathbf{c}$, if they exist:

$$\mathbf{a} = [1, 2, 3, 4, \dots, 11], \quad \mathbf{b} = [20, 18, 16, 14, \dots, 2], \quad \mathbf{c} = [1, 4, 9, 16, 25, \dots, 121].$$

2. Evaluate the sum

$$\sum_{n=20}^{50} \frac{2n+1}{1+n^2} = \frac{41}{1+20^2} + \frac{43}{1+21^2} + \dots + \frac{99}{1+49^2} + \frac{101}{1+50^2}.$$

3. Define the coefficient matrix A and the right-hand-side vector \mathbf{b} for the linear system

$$\begin{array}{rcccccc} 6x_1 & + & 4x_2 & - & x_3 & + & x_4 & & & = & 5 \\ -x_1 & - & 2x_2 & & & & & + & x_5 & = & 3 \\ 2x_1 & + & 2x_2 & + & 9x_3 & + & 2x_4 & & & = & 8 \\ & & 3x_2 & & & & & - & 4x_5 & = & -11 \\ -x_1 & & & - & 2x_3 & - & 2x_4 & + & 5x_5 & = & 3. \end{array}$$

Set up the augmented matrix $[A \mid b]$, calculate the reduced row-echelon form R and display the appropriate message: **Linear systems has no solutions**, **Linear system has a unique solution**, **Linear system has infinitely many solutions**. (Decide which case is appropriate just by looking at R . You are **not** asked to find a solution.)

4. Create a plot of the polynomial $x^5 - 9x^3 + 2x - 4$ for $-3 \leq x \leq 3$ put gridlines on your plot and then save the plot in a PostScript file `myplot.ps` (using `print`).
5. * Find the unique point of \mathbb{R}^2 where the two curves

$$y = x^3 - 5x - 1 \quad \text{and} \quad y = 5 - e^x$$

intersect. The coordinates should be correct to machine precision.

This test paper and any rough work
must be handed back
at the end of the test.

STUDENT-OWNED COMPUTERS FOR MATHEMATICS COURSES

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

All of our courses have a 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					