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

2. Algebra Notes

3. Calculus Notes

4. Past Exam Papers Booklet

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GENERAL INFORMATION FOR
MATH1231 SUMMER SESSION 2010-2011

Important

If you did not do MATH1231 MATHEMATICS 1B in Semester 2 then you should strongly consider buying the MATH1231/MATH1241 Course Pack 2010. These packs are available at the UNSW Bookshop.

The Course Pack was prepared for use in Semester 2. To adapt it for use in the Summer Session you should:

1. **DISCARD THE INFORMATION BOOKLET** from the Course Pack and replace it with this booklet. This booklet is available at the Mathematics School Office, via the web from the School web-site and from the MATH1231 module in Blackboard.

2. **DELETE ALL SCHEDULES** for lectures, problems and tests in the Algebra Notes and the Calculus Notes. The schedules for problems and tests are different in the Summer Session and they are given in this Booklet.

Prerequisites

MATH1231, Mathematics 1B, is a first year 6UOC course offered by the School of Mathematics and Statistics in semester 2 and Summer Session. It develops the Calculus and Linear Algebra introduced in MATH1131, Mathematics 1A. MATH1241, Higher Mathematics 1B, is the higher version of MATH1231 and covers the topics of MATH1231, but in greater depth. Both courses contain an introduction to Probability and Statistics.

The prerequisite for MATH1231 Mathematics 1B is a conceded pass or better in either MATH1131, MATH1141 or MATH1151. The exclusions for MATH1231 are:

MATH1021, MATH1031, MATH1241, MATH1251, ECON1202 and ECON2291.

Aims

The aim of MATH1231 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. Students who achieve good competence in this course should be well equipped both technically and psychologically to cope with the mathematics that they will meet later in their program. It is 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 working through the exercises, the sample class tests and the past examination papers that are included in the MATH1231 course pack.

Teaching Strategies

MATH1231 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.

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 and Statistics 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 individual 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 assessment tasks scheduled during the semester 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 Ms F. Fan (Francy). All administrative enquiries concerning first year Mathematics courses should be sent to Ms Fan, 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. It is your responsibility to regularly check your university email account. Please state your student number in all emails to the First Year Office.

Lectures

Classes in MATH1231 Summer Session are held on Monday afternoon, Tuesday morning and Thursday afternoon. All lectures are to be given in the Keith Burrows Theatre:

Monday: 1-2pm Algebra lecture *4-5pm Calculus lecture
Tuesday: 9-10am Calculus lecture *12-1pm Algebra lecture
Thursday: 1-2pm Algebra lecture 4-5pm Calculus lecture

*In week 1 only, the Monday Calculus lecture will be held from 2-3pm, and the Tuesday Algebra lecture will be held from 10-11am. The lecturers for MATH1231 are:

Algebra  Dr D. Trenerry
Calculus Dr J. Kress (weeks 1 to 4); Dr D. Angell (weeks 5 to 8)

The course authority for MATH1231 is the Director of First Year Studies, Dr Peter Blenner-hassett (weeks 1 to 4) and then Mr. Peter Brown (weeks 5 to 8), who can be contacted via the
First Year Office, as detailed above. The lecturer in charge of computing is Dr Jonathan Kress, Room 4102 in the Red Centre. Important announcements and handouts may be given out in lectures, so missing lectures (or even arriving late) may cause significant difficulties for you.

**Tutorials**

All students will be assigned to a single tutorial in each of the 2 hour blocks between lectures, which means that all students will have one free hour between lectures. Specifically, students will be assigned to a tutorial that either meets at the times

- Monday 2-3pm, Tuesday 10-11am, Thursday 2-3pm
- or at the times
- Monday 3-4pm, Tuesday 11-12noon, Thursday 3-4pm.

You will have the same tutor for all tutorials and there is not a fixed division into Algebra and Calculus tutorials.

**The first tutorial will be on Thursday 25th November.** All tutorial information is available via myUNSW and you should check this site regularly as we may need to amalgamate or stream the tutorials. You will receive an email to your student account if we change your tutorial room or time.

Attendance at tutorials is compulsory and the roll will be called at all tutorial classes.

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 series”.
- Be an active participant in tutorials, asking and answering questions rather than just sitting and watching.

All the class tests which you submit (except formal examination scripts) will be marked by your tutor and returned through tutorials. In the rare event that your tutor has not arrived at your tutorial by 10 minutes past the hour a student in the tutorial class should contact the First Year Office, by phone if the class is not in the Red Centre, so that a replacement tutor can be arranged.

**Computing and self-paced online modules**

In addition to the Calculus and Algebra components, there is a Computing component in MATH1231. This is partly interwoven with the Calculus and Algebra components and partly independent of them. To assist in the self-directed learning of this component of the course, online self-paced learning modules are available in UNSW Blackboard. These modules guide
students through the computing component of this course and are integrated with, and enhance the lecture and tutorial content presented in Calculus and Algebra.

Students are expected to work through and complete the specified online modules according to the schedule given on page 12. Associated with each module is a graded quiz, done in Maple TA, and the completed quizzes contribute 4% to the final grade. Learning content will be accessible at all times for learning and revision, but the online assessments will only be available for credit until the published deadlines, given on page 12.

More information about the Computing component is given later in this booklet (see pages 12 and 27) and in the booklet Computing Laboratories Information and First Year Maple Notes 2010. These computing notes are freely available from the MATH1231 module on UNSW Blackboard, and also on the computers in the mathematics computing laboratories. To assist you with any technical issues, computing consultants are available in the laboratory RC-G012 during weeks 1 to 5. For details of times and laboratory opening hours see page 27.

UNSW Blackboard

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

http://lms-blackboard.telt.unsw.edu.au

The School of Mathematics and Statistics web pages for Current Students also have a Quicklink to UNSW Blackboard. Access to UNSW Blackboard (and myUNSW) is via a "Web Single Sign On" page, where your "User ID" is z immediately followed by your student number and your "Password" is your zPass. The "Forgot Your Password?" button is a link to the IDM Self Service page where you can reset or "unlock" your zPass if needed. Help for using Blackboard is available via links from the UNSW Blackboard landing page or directly via the URL

http://support.telt.unsw.edu.au/blackboard

Once logged in to UNSW Blackboard you will have a choice of modules for all your courses, including your current mathematics course. The home pages for all UNSW Blackboard modules for First Year Mathematics courses have a similar structure with links to "Important Information", "Course Outline", "Public Course Homepage" and "Maths Info (Maths marks)" in the course menu near the top left of the page. The screen shots below show two different views of the course menu for MATH1231.
The view on the left is the default view you see on first access to the course while the view on the right is a tree view, showing some of the folders expanded.

The “Maths Info (Maths marks)” link 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.

The “Course Materials” link in the course menu takes you to a folder containing further information and access links for the course. In particular, links to videos on how to use Maple are in

\[\text{MATH1231 Mathematics 1B} \quad \text{Course Materials} \rightarrow \text{Computing Component} \rightarrow \text{Videos}\]

while text and video instructions for using Maple TA are in

\[\text{MATH1231 Mathematics 1B} \quad \text{Course Materials} \rightarrow \text{Online Assessment in Algebra, Calculus and Computing}\]

**Course Materials**

The course materials for MATH1231/1241 are:

\* MATH1231/1241 *Course Pack 2010.*

\* *Computing Laboratories Information and First Year Maple Notes 2010.*


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 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 for Semester 2 – replace with this Information Booklet for Summer session.
- Algebra Notes (for MATH1231);
- Calculus Notes (for MATH1231);
- 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 MATH1231 module on the UNSW Blackboard server. Information on accessing the UNSW Blackboard server is given above.

**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.

Full time members of staff will announce through lectures when they are available for consultation. 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.

**Student Support Scheme**

The Student Support Scheme (SSS) is a drop-in consultation centre where students can come for free help with certain first- and second-year mathematics courses. The type of help offered by the tutors of the SSS is either one-on-one assistance; or, at busier times, assistance in small groups. Students typically bring their partial solutions of mathematics coursepack questions to the SSS office. An SSS tutor then provides guidance and advice. The SSS office is located in **RC-3064**. During summer session the Student Support Scheme will be open from week 2, with further details of opening times available on the website

http://www.maths.unsw.edu.au/students/current/help/sss.html
Problem sets

Problems for Algebra are included in the Algebra Notes and similarly, problems for Calculus are included in the Calculus Notes. These problem sets are also available in the algebra component and calculus component folders of the Course Materials folder for MATH1231 in UNSW Blackboard. Problems for the Maple computing component are available online in the Maple self-paced learning modules folder on UNSW Blackboard, and on page 32 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.

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” 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


Assessment

The final raw mark will be made up as follows:

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra and Calculus class tests</td>
<td>20%</td>
</tr>
<tr>
<td>Online Algebra and Calculus tests</td>
<td>4%</td>
</tr>
<tr>
<td>Online Computing tests (Maple)</td>
<td>4%</td>
</tr>
<tr>
<td>Laboratory Computing test (Maple)</td>
<td>8%</td>
</tr>
<tr>
<td>End of semester exam</td>
<td>64%</td>
</tr>
</tbody>
</table>

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 (Maths marks)” link on the home page of MATH1231 on the UNSW Blackboard server. 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 Monday 7th February 2011.

- 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.
The end of session exam will be held in the week beginning Monday, 7th February 2011. Once the examinations section finalises the examination timetable, you will be able to find out the time and place of the MATH1231 examination from myUNSW. The web page


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 in-semester assessment tasks.

- If your final mark is in the range 46-49 then you may be awarded the grade of “Pass Conceded” (PC) provided your average mark for all your courses is sufficiently high. This decision is not made by the School of Mathematics and Statistics. The rules governing the granting of the grade of PC are on the web page


- **Medical certificates will generally not be accepted for missing the deadlines for the online tests.** See the section on “Computing Information” for more details.

### 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.telt.unsw.edu.au/mapleta

where your “User login” is z followed by your UNSW student number and the “Password” is your zPass. The schedule for these online tests for MATH1231 is given below.

<table>
<thead>
<tr>
<th>Test</th>
<th>Available</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1 - Math 1B Calculus online test 1</td>
<td>2pm Wednesday 1/12/2010</td>
<td>1pm Wednesday 8/12/2010</td>
</tr>
<tr>
<td>TP2 - Math 1B Algebra online test 1</td>
<td>2pm Wednesday 8/12/2010</td>
<td>1pm Wednesday 15/12/2010</td>
</tr>
<tr>
<td>TP3 - Math 1B Calculus online test 2</td>
<td>2pm Wednesday 5/1/2011</td>
<td>1pm Wednesday 12/1/2011</td>
</tr>
<tr>
<td>TP4 - Math 1B Algebra online test 2</td>
<td>2pm Wednesday 12/1/2011</td>
<td>1pm Wednesday 19/1/2011</td>
</tr>
</tbody>
</table>

The material covered by these tests is the same as for the tutorial algebra and calculus tests, as given on page 22 and 25.

Detailed information on how to use the online testing system is available from the MATH1231 course module on UNSW Blackboard in the
folder. In this section there is also a link, labelled “Link to 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 1.

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 at 2pm 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;
- only a limited numbers of users can have simultaneous access to Maple TA, so do NOT leave your attempts at these tests to the last 4 hours. 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.

**Class tests**

Details of the dates and content of tests are given on pages 22 and 25 of this booklet. Sample copies of the tests are included in the Algebra and Calculus Notes.

**Note that**

- **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, during the test you must not have visible any material relevant to 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 tutorial tests in MATH1231 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. Further, past records indicate that about 80% of students whose best three class tests totalled to 17 or less did not get an overall pass in MATH1231.

Computing Assessment

There will be two different forms of computing tests. An initial set of four small online tests will be run using Maple TA, followed by a laboratory based test in week 6. The online 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 UNSW Blackboard. Details on using Maple TA for online tests have been given on page 10. These online 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. You will have an unlimited number of attempts at these online computing tests, both before and after the deadlines in the following table. Note that it is only your best mark on each test that counts towards your final grade. Again, do NOT leave your attempts at these online tests until the last day. Inability to complete these online tests due to congestion in the school computing labs or in Maple TA on the last day will NOT be accepted as an excuse for missing the deadlines.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Due to be completed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>4pm Friday of week 3 (10/12/2010)</td>
</tr>
<tr>
<td>3 and 4</td>
<td>4pm Friday of week 5 (07/01/2011)</td>
</tr>
</tbody>
</table>

In the tables above and in Maple TA the computing tests numbered 1, 2, 3 and 4 correspond to the Blackboard self-paced learning modules 8, 9, 10 and 11 respectively. The tests 1–4 count towards your final mark while tests associated with the Maple module 12 are for further preparation for the Maple lab test in week 6 and do not explicitly count towards your final mark. The online self-paced learning modules 1 to 7 from MATH1131 are provided as a revision resource in Blackboard. (Note that modules 6 and 7 were available in MATH1131 and MATH1141 but their online tests were not counted towards the final mark in MATH1131 or MATH1141.)

The second form of computing test will be run under exam conditions in the School’s laboratories. The time of your laboratory test is determined by your tutorial, so no booking is needed, and you must bring your UNSW Student ID card to the test. Details of the laboratory test are given on page 31 and practice problems for the test are given on page 32. There will also be a practice test available in Maple TA from the end of week 4. All computing tests are linked to the Algebra and Calculus material, so you should make sure you understand the course work before trying them.

Finally, the end of semester exam may contain one or two sub-questions requiring a knowledge of Maple.
Graduate Attributes

This course will provide you with a good working knowledge of 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. 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:


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 15.

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 Summer Session 2010-2011”. 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 the original medical certificate to your tutor and also give a copy of the medical certificate to your tutor. This information 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.)
• If you are unable to attend your Maple laboratory test session because of illness you should contact the First Year Office as soon as possible and on submission of appropriate documentation, another test time will be arranged.

• 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.

Information and handouts
Important announcements may be made in lectures. 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. All important administrative announcements, especially those indicating a change to information contained in this booklet, are repeated as announcements on UNSW Blackboard. Further, notices of an urgent nature may be emailed to students at their official UNSW email address.

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.

Course improvement
The School of Mathematics and Statistics has several mechanisms in place for regular review and improvement of First Year courses. One component of the review process is student feedback, generated either by the CATEI surveys or by direct contact from individual students or groups of students. Other elements of our course review processes include:

• feedback on program requirements from academics in other Schools and Faculties;

• regular rotation of lecturing staff teaching First Year courses to generate fresh and innovative approaches to the course content and structure;

• regular review of the quality of the tutors and tutorial problems.
A recent change, requested in several CATEI surveys, is the expansion of the previous “Outline calculus lecture notes” for MATH1131 and MATH1231 to a complete set of calculus notes, comparable to the well-liked algebra lecture notes. Another recent change has been the introduction of short, online tests for Maple associated with the redesigned self-paced Maple learning modules. These changes were again in response to CATEI requests to provide more assistance with learning Maple. Even more recent has been the introduction of short, screen-capture videos to provide instruction on various aspects of the use of the computing facilities within the school. Further, a collection of short videos demonstrating solution techniques in key topic areas is being produced, again in response to requests for more online support in the course.

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 MATH1231. If your problems are more serious, or haven’t been resolved to your satisfaction, come to see me (Peter Blennerhassett or Peter Brown) 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 (currently on the lower ground floor of the north wing of the Chancellery Building) 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
to 28/12/2010

Peter Brown
Director of First Year Studies
from 29/12/2010

School of Mathematics and Statistics
fy.MathsStats@unsw.edu.au
APPLICATIONS FOR SPECIAL CONSIDERATION IN FIRST YEAR MATHEMATICS SUMMER SESSION 2010-2011

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. Within 3 days of the examination, you must contact the First Year Office in person with copies of all the documentation which you submitted through Student Central.

3. 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.

4. 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 Mathematics website by late Wednesday 16th February 2011.

   b) A final list of results and of grants of additional assessment will be available via the Mathematics website by late Friday 18th February 2011.

   c) On Monday 21st February 2011 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.

5. 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 Summer session additional assessment examinations will be held on Tuesday 22nd February 2011.

6. 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.

7. 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 then you should contact the Student Equity and Disabilities Unit (SEADU) who provide confidential support and advice. Their web site is

http://www.studentequity.unsw.edu.au

SEADU may determine that your condition requires special arrangements for assessment tasks. Once the First Year Office has been notified of these we will make every effort to meet the arrangements specified by SEADU.

Additionally, if you have suffered a serious misadventure during semester then you should provide full documentation to 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
Plagiarism is the presentation of the thoughts or work of another as one’s own. Examples include:

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

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

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

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

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

2 Adapted with kind permission from the University of Melbourne
ALGEBRA SYLLABUS AND LECTURE TIMETABLE

The algebra course for MATH1231 is based on chapters 6 to 9 of the Algebra Notes. Lecturers will not cover all of the material in these notes in their lectures as some sections of the notes are intended for reference and for background reading.

The following timetable is the basic timetable and syllabus which will be followed by MATH1231 algebra lecturers. Lecturers will try to follow this timetable, but some variations are inevitable.

Chapter 6. Vector Spaces

The aim of this section of the course is to introduce the general theory of vector spaces and to give some basic examples. The majority of examples will be for the real vector space $\mathbb{R}^n$, but occasional examples may be given for the complex vector space $\mathbb{C}^n$, as well as from vector spaces of polynomials.

Lectures 1 and 2. Introduction to vector spaces and examples of vector spaces (6.1). Properties of vector arithmetic (6.2).
Lecture 3. Subspaces (6.3).
Lectures 4 and 5. Linear combinations and spans (6.4). Linear independence (6.5).
Lectures 6 and 7. Basis and dimension (6.6).

Chapter 7. Linear Transformations

The basic aims of this section are to introduce the general theory of linear transformations, to give some geometric applications of linear transformations and to establish the close relationship between linear functions and matrices.

Lecture 8. Introduction to linear maps (7.1). Linear maps and the matrix equation (7.2).
Lecture 9. Geometrical examples (7.3).
Lecture 10. Subspaces associated with linear maps (7.4).
Lecture 11. Rank, nullity and solutions of $Ax = b$ (7.4.3). Further applications (7.5).

Chapter 8. Eigenvalues and Eigenvectors

The aims of this section are to introduce the ideas of eigenvalue and eigenvector and to show some applications of these ideas to diagonalization of matrices, evaluation of powers of matrices and solution of simple systems of linear differential equations. Examples will be restricted to $2 \times 2$ matrices and very simple $3 \times 3$ matrices.

Lecture 12. Definition, examples and geometric interpretation of eigenvalues and eigenvectors (8.1).
Lecture 13. Eigenvectors, bases and diagonalization of matrices (8.2).
Lectures 14 and 15. Applications to powers of matrices and solution of systems of linear differential equations (8.3).

Chapter 9. Probability and Statistics

The main objective of this section is to introduce some of the ideas in mathematical probability and apply these concepts to discrete valued random variables and their associated probability distributions. Applications of two discrete probability distributions to commonly occurring issues are used throughout this chapter to illustrate the wide range of problems that can be tackled with simple, but careful probabilistic analysis.
Lecture 16. Introduction to probability via examples from recent events and classical problems (9.1).

Lecture 17. Revision of set theory (9.2). Mathematical probability (9.3.1, 9.3.2).

Lecture 18. Probabilities and probability rules, counting rules and associated problems, statistical independence (9.3.3–9.3.6).


Lecture 20. Binomial distribution and applications (9.5.1, 9.5.2).

Lecture 21. Geometric distribution and applications, the Chebyshev inequality (9.5.3, 9.5.4).

Lecture 22. Estimating proportions, margin of error and applications (9.6)

Lecture 23. Review.
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], 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 MATH1241 – they relate to topics which are only covered in MATH1241.

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 week of the course and a suggested (minimal) set of homework problems for MATH1231 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. Tutors may need to vary a little from this suggested problem schedule.

<table>
<thead>
<tr>
<th>Week</th>
<th>Algebra problems</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chapter</td>
<td>Problems up to</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>46</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>30 (Test 1)</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>24 (Test 2)</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>52</td>
</tr>
</tbody>
</table>
CLASS TESTS AND EXAMS

Questions for the class tests in MATH1231 will be similar to the questions marked [R] and [H] in the problem sets. Since each class test is only twenty 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).

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.

Algebra class test 1 will be given on Thursday in week 4 and will be based on suggested problems for weeks 1 to 3.

Algebra class test 2 will be given on Thursday in week 7 and will be based on suggested problems for weeks 4 to 6.

THEORY IN THE ALGEBRA COURSE

The theory is regarded as an essential part of this course and it will be examined both in class tests and in the end of year examination.

You should make sure that you can give DEFINITIONS of the following ideas:

Chapter 6. Subspace of a vector space, linear combination of a set of vectors, span of a set of vectors, linear independence of a set of vectors, spanning set for a vector space, basis for a vector space, dimension of a vector space.

Chapter 7. Linear function, kernel and nullity of a linear function, image and rank of a linear function.

Chapter 8. Eigenvalue and eigenvector, diagonalizable matrix.

Chapter 9. Probability, statistical independence, conditional probability, discrete random variable, expected value (mean) of a random variable, variance of a random variable, binomial distribution, geometric distribution, margin of error.

You should be able to give STATEMENTS of the following theorems and propositions.

Chapter 6. Theorem 1 of §6.3, Propositions 1 and 3 and Theorem 2 of §6.4, Proposition 1 and Theorems 2, 3, 4, 5 and 6 of §6.5, Theorems 1, 2, 3, 4, 5, 6 and 7 of §6.6.

Chapter 7. Theorems 2, 3 and 4 of §7.1, Theorem 1 and 2 of §7.2, Proposition 7 and Theorems 1, 5, 8, 9 and 10 of §7.4.

Chapter 8. Theorems 1, 2 and 3 of §8.1, Theorem 1 and 2 of §8.2.

Chapter 9. Theorem 2 of §9.3, Theorems 1, 2 and 3 of §9.4.

You should be able to give PROOFS of the following theorems and propositions.

Chapter 6. Theorem 2 of §6.4, Theorems 2 and 3 of §6.5, Theorem 2 of §6.6.

Chapter 7. Theorem 2 of §7.1, Theorem 1 of §7.2, Theorems 1, 5 and 8 of §7.4.

Chapter 8. Theorem 1 of §8.1.

Chapter 9. Theorems 2 and 3 of §9.4.
CALCULUS SYLLABUS FOR
MATH1231 MATHEMATICS 1B

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 subject 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 subject. 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 8th and 10th editions of Salas & Hille are shown as SH8 and SH10.

1. **Functions of several variables.** (3 hours)
   - Contours and level curves, partial derivatives.
   - Mixed derivative theorem, increment estimation.
   - Chain rules, tangent planes.
   - SH8: 14.1-14.4  
   - SH10: 15.1-15.4

2. **Integration techniques.** (4 hours)
   - Trigonometric integrals and reduction formulae.
   - Trigonometric and hyperbolic substitutions.
   - Rational functions and partial fractions.
   - Further substitutions.
   - SH8: 8.3  
   - SH10: 8.3
   - SH8: 8.4  
   - SH10: 8.4
   - SH8: 8.5  
   - SH10: 8.5
   - SH8: 8.6  
   - SH10: 8.6

3. **Ordinary differential equations.** (6 hours)
   - Particular, general, explicit and implicit solutions.
   - 1st order equations: separable, linear, exact.
   - Modelling with odes.
   - 2nd order linear equations with constant coeffts:
     - homogeneous, non-homogeneous (undetermined coeffts).
   - SH8: 18.1
   - SH10: 9.1, 9.2, 19.1, 19.2
   - SH8: 8.9, 18.2
   - SH10: 15.9

4. **Taylor series.** (7 hours)
   - Taylor polynomials, Taylor’s theorem.
   - Application to stationary points.
   - **Sequences**: convergence and divergence;
     - combination of sequences.
   - **Series**: partial sums; convergence;
     - kth term test for divergence;
     - comparison and ratio tests;
     - alternating series (Leibniz’ test);
     - absolute and conditional convergence;
     - rearrangement of series.
   - Taylor and Maclaurin series.
   - **Power series**: radius and interval
     - of convergence; operations on power series.
   - SH8: 11.5
   - SH10: 12.6, 12.7
   - SH8: 10.2, 10.3
   - SH10: 11.2-11.4
   - SH8: 11.1, 11.2  
   - SH10: 12.1, 12.2
   - SH8: 11.1-11.3
   - SH10: 12.3, 12.4
   - SH8: 11.4  
   - SH10: 12.5
   - SH8: 11.6
   - SH10: 12.7
   - SH8: 11.7, 11.8
   - SH10: 12.8, 12.9

5. **Applications of integration.** (3 hours)
   - Average value of a function.
   - Arc length.
   - Arc length in polar coordinates.
   - Area of surfaces of revolution.
   - SH8: 5.8
   - SH10: 5.9
   - SH8: 9.8
   - SH10: 10.7
   - SH8: 9.5, 9.8
   - SH10: 10.7
   - SH8: 9.9
   - SH10: 10.8
PROBLEM SETS

The Calculus problems are located at the end of each chapter of the Calculus Notes booklet. They are also available from the course module on the UNSW Blackboard 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 [HH]. A few problems are marked with an [X] for MATH1241 students.

All students should make sure that they attempt the questions marked [R]. The problems marked [H] or [HH] are intended as a challenge for students in MATH1231 as well as MATH1241. Some harder parts of [R] problems are marked with a star. Any problems which depend on work covered only in MATH1241 are marked [X].

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 week of the course and a suggested (minimal) set of homework problems for MATH1231 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. Tutors may need to vary a little from this suggested problem schedule.

<table>
<thead>
<tr>
<th>Week</th>
<th>Calculus problems</th>
<th>Homework Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Problems up to</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>22 (Test 1)</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>44</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>18 (Test 2)</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>49</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>43(a), 44, 45, 48</td>
</tr>
<tr>
<td>2</td>
<td>3(c), 5, 7, 10(a), 13</td>
<td></td>
</tr>
</tbody>
</table>
CLASS TESTS AND EXAMS

Questions for the class tests in MATH1231 will be similar to the questions marked [R] and [H] in the problem sets. Since each class test is only twenty minutes in length only shorter straightforward tests of theory and practice will be set. As a guide, see the recent past class test papers (at the end of the Calculus Notes). The Calculus class tests will take place in tutorials in the following weeks:

**Test 1**    Thursday Week 3

**Test 2**    Thursday Week 6

The tests will cover sections of the syllabus as shown in the table below. The test questions will be similar to the questions labelled by [R] and [H] in the Calculus Problems. The table shows which problems are relevant to each test.

<table>
<thead>
<tr>
<th>Test</th>
<th>Syllabus sections</th>
<th>[R] and [H] problems in</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chapter 1 and up to chapter 2.2</td>
<td>Chapter 1 and Q1 - up to Q14 in chapter 2</td>
</tr>
<tr>
<td>2</td>
<td>Chapter 2.3 - 2.5 and all of chapter 3</td>
<td>Chapter 2, Q15 - Q22, and Q1 - Q44 in chapter 3</td>
</tr>
</tbody>
</table>

It is important to note that the class tests do not cover the whole syllabus.

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.
SCHEDULE OF ALL CLASS ASSESSMENTS

Lectures and tutorials run during weeks 1–8. The table below gives the schedule of online tests, class tests and computing assessments.

<table>
<thead>
<tr>
<th>Week</th>
<th>Algebra</th>
<th>Calculus</th>
<th>Maple Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>TP1, Test 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Online tests 1 and 2 due</td>
</tr>
<tr>
<td>3</td>
<td>TP2, Test 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Christmas and New Year break

<table>
<thead>
<tr>
<th>Week</th>
<th>Algebra</th>
<th>Calculus</th>
<th>Maple Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td></td>
<td>TP3, Test 2</td>
<td>Online tests 3 and 4 due</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>Test in Laboratory</td>
</tr>
<tr>
<td>7</td>
<td>TP4, Test 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

End of session examination will be held during the week 7th to 11th February 2011. Details will be available via myUNSW.

Examples of class tests are contained in the Algebra Notes and in the Calculus Notes. 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 and in Maple TA.
How much?

In MATH1231 there are online computing tests worth 4% of your final mark and there will be a laboratory test, in week 6 worth 8% of your final mark. Further, there will be exam questions worth at least another 3% of your final mark so in total 15% of your final mark is derived from the computing component of the course. 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.

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

- Secondly, you will gain some experience in teaching yourself how to use a complicated computing package. This is a skill that will be needed in other courses at UNSW and in the workforce.

Computing lab

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

The laboratories will normally be open as follows:

<table>
<thead>
<tr>
<th></th>
<th>M020</th>
<th>G012</th>
</tr>
</thead>
<tbody>
<tr>
<td>During semester:</td>
<td>Monday to Friday</td>
<td>9.00 am to 9 pm</td>
</tr>
<tr>
<td>Week 6</td>
<td>Monday to Friday</td>
<td>9.00 am to 9 pm</td>
</tr>
<tr>
<td></td>
<td>Saturdays, Sundays</td>
<td>Closed</td>
</tr>
<tr>
<td>During holidays:</td>
<td>Monday to Friday</td>
<td>Closed</td>
</tr>
</tbody>
</table>
| Public holidays and Weekends | Closed       | Closed      | Closed.

Any changes to these times will be posted on the door of Room M020.

Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing tests on time.
Getting help with Maple

Maple computing consultants will be available in the G012 lab during summer session according to the following schedule.

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Times for Maple Consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday</td>
<td>3pm to 5pm</td>
</tr>
<tr>
<td></td>
<td>Tuesday</td>
<td>11am to 1pm</td>
</tr>
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Accounts and passwords

If you had an account for computers in the Mathematics Labs in semester 1 or 2, you will continue to use the same account with the same password in summer session. Remember that for the computers in the school laboratories, your login ID is “z” followed immediately by your seven digit student number and your password is your zPass. If you have difficulties logging in, the computers will allow a five minute login with ID “newuser” and password “newuser” where you can access https://idm.unsw.edu.au and reset or unlock your zPass. Be aware that two consecutive failed login attempts will lock you out of the computing system for 30 minutes, or until you reset or unlock your zPass. If you have forgotten how to log in and use the lab computers help can be found in chapters 1–4 of the Computing Laboratories Information 2010 booklet and the School web site.

If you have problems with your account, you should go to Room M022 on the Mezzanine Level of the Red Centre between 1pm and 2pm on any weekday from Thursday of Week 1. You will need to show your student card.

Computing syllabus

The Maple computing component is taught via a series of self-paced modules located in UNSW Blackboard and available from the folder, using Blackboard breadcrumb notation,

MATH1231 Mathematics 1B  Course Materials  >  Computing component

You are expected to work steadily through these modules, completing the test in Maple TA at the end of each module before moving on to the next module. The test in Maple TA for module 11 must be completed by 4pm Friday of week 5, but there are other internal deadlines for the component quizzes. The timetable for the completion of these small tests is explained in detail in the section on Computing tests on page 12 and is clearly visible in Maple TA.

The online teaching package for MATH1231 consists of the following modules:

Module 8 Functions of two or more variables: defining functions, partial derivatives, mixed derivatives and plotting functions of two variables.

Module 9 Further calculus: partial fractions, ordinary differential equations, initial conditions, sequences, series and Taylor series.

Module 10 Further linear algebra: matrix operations and properties, nullspace, kernel, rank, nullity, eigenvalues and eigenvectors.
Module 11 Geometry: dot and cross products, the geom3d package and its use.

Module 12 Programming in Maple: Maple procedures, booleans, loops and conditionals.

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 can be heavily used so 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 online assessments until the last few hours.

You should not use Maple to do your Algebra and Calculus tutorial problems (unless it is explicitly indicated) until you have understood the material thoroughly, as working through the problems is important for learning the material. Once the material is understood you can then use Maple to check your answers. You may also use Maple for other subjects. 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 details of the online Maple tests have been described previously in the section on Computing tests on page 12.

The second form of computing test will be run under exam conditions in the School’s computing laboratories during week 6. The test will be conducted using Maple TA and your test time is determined by your tutorial timetable. There is no need to book for the test and by logging into Maple TA early in week 5 you will see a link to your laboratory test. You must inform the lecturer-in-charge of computing if you do not see this link, or there are problems with your allocated test timeslot. A sample Maple laboratory test will be available from the end of week 4. You will have unlimited attempts at this test up until the start of the week 6. As usual you must bring your UNSW student ID card to the laboratory test.

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

Finally, the end of semester exam may contain one or two sub-questions requiring a knowledge of Maple.

Special consideration for the laboratory test

If you are unable to attend your Maple laboratory test session because of illness or other circumstances outside of your control you should contact the First Year Office as soon as possible and on submission of a suitable medical certificate or other appropriate documentation, another test time will be arranged. Tutors do not have permission to accept medical certificates for the computing test.

If possible, special arrangements for the computing laboratory test will be made for students with supporting documentation from SEADU. If you wish to exercise this option, you must contact Dr Kress before the laboratory tests have commenced so that any needed special facilities can be implemented.
Details of the computer laboratory Maple test follow in the next pages.
MATH1231 LABORATORY TEST

Tests will be held in the Red-Centre computer lab G012 at various times during Week 6. Based on your tutorial timetable, you will be allocated a time slot in week 6 and a Maple TA laboratory test class before the end of week 4. You can check your laboratory test time by logging into Maple TA. If the allocated laboratory test time is unsuitable you need to contact the lecturer in charge of computing to see if other time slots are available. In general you will need very strong reasons to change the allocated test time as it is expected that all students are on campus for the whole of the teaching hours of summer session.

The test will be on the features of Maple which are covered in Chapter 1 and Chapter 2 of the First Year Maple Notes 2010.

You will NOT need to remember the exact syntax of each command because you will be provided with a hard copy of the First Year Maple Notes in the test and you will also have access to an on-line 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.**

As the laboratory test will be conducted using Maple TA, the format of this test will be different to the previous Maple laboratory tests you may have taken. The style of question asked within the Maple TA based test will be similar to those posed in the online Maple tests associated with the Maple self-paced learning modules. You can expect the questions to be more difficult than those in the online Maple tests and closer to those in the practice problems and the sample test.

A sample laboratory test will be made available in Maple TA by the end of week 4. Try to do it in 40 minutes AFTER you have worked through all the practice problems. More details on this new form of laboratory test will be made available during the session and posted on Blackboard.

You will NOT be allowed to take any calculators or writing materials (pens, pencils, paper) into the test.
PRACTICE PROBLEMS MATH1231/1241

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

1. Find \( \lim_{n \to \infty} n^{-k} \) where \( k \) is a real number greater than 1. Answer: 0

2. Find \( \frac{\partial^2}{\partial x \partial y} \left( x^2 y^2 e^{x^2+y^2} \right) \)
and apply \texttt{factor} to your answer.

Answer: \( 4xye^{(x^2+y^2)}(1+y^2)(x^2+1) \)

3. Let \( \mathbf{u} \in \mathbb{R}^{15} \) be the vector whose \( k \)th component, for \( k = 1, \ldots, 15 \), is \( k^2 \) and \( \mathbf{v} \in \mathbb{R}^{15} \) be the vector whose \( k \)th component, for \( k = 1, \ldots, 15 \), is \( k^3 \). Use the command \texttt{seq} to generate these vectors and then evaluate, to 3 significant figures, the vector which is the projection of \( \mathbf{u} \) onto \( \mathbf{v} \).

Answer: \[
\begin{bmatrix}
.0754, & .603, & 2.04, & 4.83, & 9.43, & 16.3, & 25.9, & 38.6, & 55.0, & 75.4, & 100., & -130., & 166., & 207., & 255. \\
\end{bmatrix}^T
\]

[Note: you can use the Maple command \texttt{interface(rtablesize=15)}; to tell Maple to display the elements of vectors of length 15.]

4. Given the three points \( A(1,2,3) \), \( B(1,-3,5) \) and \( C(0,2,4) \), let

- \( L1 \) be the line through \( A \) and \( B \) and
- \( L2 \) be the line through \( C \) parallel to \( (1,0,-2) \) and
- \( P1 \) be the plane through \( A, B \) and \( C \) and
- \( P2 \) be the plane through \( A \) with normal \( (3,0,-1) \).

Using the \texttt{geom3d} package, or otherwise:

(a) Find, in degrees to 4 significant figures, the angle between \( L1 \) and \( L2 \). Answer: 70.60 degrees

(b) Find the distance between \( L1 \) and \( L2 \). Answer: \( \frac{5}{129} \sqrt{129} \)

(c) Use the \texttt{Equation} command to find a cartesian equation for \( P1 \) with coordinate names \( x, y, z \). Answer: \( 24 - 5x - 2y - 5z = 0 \)

(d) Find a parametric expression for the line \( L1 \). (You can do this also with the \texttt{Equation} command). Answer: \( [1, 2 - 5t, 3 + 2t] \)

(e) Find a normal to \( P1 \). Answer: \( [-5, -2, -5] \)

(f) Find, in radians to 4 significant figures, the angle between \( L1 \) and the line \( L3 \) which forms the intersection of \( P1 \) and \( P2 \). Answer: .1312

5. Let \( S1 \) be the sphere \( x^2 + y^2 + z^2 = 1 \) and \( S2 \) be the sphere with center \((1,2,3)\) and radius 3. Let \( C \) be the circle of intersection of \( S1 \) and \( S2 \) and let \( T \) be the centre of \( C \). Find the coordinates of \( T \) and the distance from \( T \) to the centre of \( S2 \).

Answer: \[
\begin{bmatrix}
3/14, & 3/14, & 9/14 \\
\end{bmatrix}, \quad \frac{11}{14} \sqrt{14}
\]
6. (a) Find a partial fraction expansion for
\[
\frac{3x^5 + 2x^4 + 6x^3 + 7x^2 + 3x - 8}{(x^2 + 1)^2(x^2 - 1)}.
\]
Answer: \[
13 \frac{1}{8} \frac{1}{x - 1} + 11 \frac{1}{8} \frac{1}{x + 1} + 7 \frac{1}{4} \frac{1}{x^2 + 1} + 13 \frac{1}{2} \frac{1}{(x^2 + 1)^2}
\]
(b) Use a Maple command to pick out the denominator of the third summand of the expansion in part (a). Answer: 4\(x^2 + 4\)

7. (a) Find the solution \(y(x)\) to the initial value problem
\[
y' - xy - x^3y^2 = 0, \quad y(0) = 1/3.
\]
Answer: \[
y(x) = \frac{1}{2 - x^2 + e^{(-\frac{1}{2} x^2)}}
\]
(b) For the \(y\) in part (a), find the value of \(y''(0)\) and apply simplify to your answer.
[Hint: dsolve does not actually create an expression called \(y\) — its output is an equation, not an expression. You will have to create \(y\) yourself, either by using assign(\%) or by using rhs(\%) to pick out the expression on the right of the equation.]
Answer: \(\frac{1}{3}\)

8. Find the solution \(y(x)\) to the initial value problem
\[
x^2y'' - 2xy' + 2y = x, \quad y'(1) = y(1) = 0.
\]
Answer: \(y(x) = x^2 - x(\ln(x) + 1)\)

9. Find the general solution to the differential equation
\[
y'' + ky = 0
\]
when \(k\) is a negative real number.
Answer: \(y(x) = C_1 e^{\sqrt{-k} x} + C_2 e^{-\sqrt{-k} x}\)

10. Find the largest positive member of the set
\[
\{ \sin k \mid k \in \mathbb{Z}, \ 1 \leq k \leq 100 \}.
\]
Answer: \(\sin(33)\)

11. Let \(p(x) = 1^2 + 2^2x + 3^2x^2 + 4^2x^3 + \ldots + 21^2x^{20}\)
and \(q(x) = 1^3 + 2^3x + 3^3x^2 + 4^3x^3 + \ldots + 21^3x^{20}\).
Find the coefficient of \(x^{21}\) in the product \(p(x)q(x)\). Answer: 246124

12. Define an abstract function \(f\) which takes two vectors \(u\) and \(v\) as its arguments and computes the projection of \(u\) onto \(v\). Apply your function to the vectors \(u = (1, 2, 3)^T\) and \(v = (3, 2, 1)^T\).
Answer: \[
\begin{bmatrix}
15 \\
10 \\
5
\end{bmatrix}^T
\]

13. Define an abstract function $f$ such that $f(x) = \sinh^{-1}(\cos(e^x))$ and use the $D$ operator to evaluate, to 10 significant figures, the derivative of $f$ at $x = 0$. Answer: $-0.7403212721$

14. a) Maple does not have a command to compute the nullity of a matrix but it does have commands `ColumnDimension` and `Rank`. Use these to define an abstract function which computes the nullity of a matrix. Apply your function to the matrix

$$
\begin{pmatrix}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9
\end{pmatrix}
$$

Answer: 1.

b) Without performing row operations, find a basis for the kernel of

$$
A = \begin{pmatrix}
1 & 2 & 3 & 4 \\
5 & 6 & 7 & 8 \\
9 & 10 & 11 & 12 \\
13 & 14 & 15 & 16
\end{pmatrix}
$$

Answer: $\{[2, -3, 0, 1]^T, [1, -2, 1, 0]^T\}$

15. Use `coeff` and `seq` to create an abstract function $f$ such that if $p$ is a polynomial expression of degree $n$ in the variable $x$ then $f(p, n)$ is the list of coefficients of $p$, arranged in increasing order. Apply $f$ to the polynomial $5 + x + 4x^2 + 2x^3 + 3x^4$. Answer: [1, 2, 3, 4, 5]

16. Define an abstract function $s$ such that if $k$ and $n$ are positive integers then $s(k, n)$ is the $k$th member of the standard basis in $\mathbb{R}^n$. [Hint: The members of the standard basis in $\mathbb{R}^n$ are the columns of the $n \times n$ identity matrix, which can be created using the `IdentityMatrix` command from the `LinearAlgebra` package.]

17. Let $a$ be the vector $(1, 2, 3)^T$ and $b$ be the vector $(4, 5, 6)^T$. Define an abstract function such that if $x$ is a vector in $\mathbb{R}^3$ then

$$
f(x) = (a \cdot x)a + (b \cdot x)b.
$$

Find the matrix (with respect to the standard basis in $\mathbb{R}^3$) for this function $f : \mathbb{R}^3 \rightarrow \mathbb{R}^3$. [This can easily be done in one line using the function $s$ from question 16.]

Answer: \[
\begin{pmatrix}
17 & 22 & 27 \\
22 & 29 & 36 \\
27 & 36 & 45
\end{pmatrix}
\]

18. Compare the results of applying the commands `ifactor`, `ifactors` and `factorset` (which is in the `numtheory` package) to the number 96. If you are not sure about what is happening here, look at the online help for these commands.

a) Find the sum of the squares of the first seven (in increasing order of magnitude) of the distinct prime factors of 1 035 981 870. Answer: 1026

b) Let $L$ be the result of applying `ifactors` to 425 217 100. Without reading a numerical value and typing it back in, assign to a variable $n$ the value of the exponent of the third factor (in increasing order of magnitude) in the prime factorization of 425 217 100. Answer: 5
19. Read the online help for the add and mul commands to find out how you can use these commands to add up or multiply the members of a set or list without having to know how many items there are in the set or list. (Look at the second dot point in the help entry and at the fourth and fifth command lines in the examples at the end of the entry.)

Define an abstract function which calculates the sum of the squares of the distinct prime factors of a given integer. Apply your function to 1 035 981 870. Answer: 3356

20. Use a for loop to display, for $k = 1, 2, \ldots, 10$, the sum of the first 15 terms of the series

$$
\sum_{n=1}^{\infty} n^k.
$$

Answer: 120, 1240, 14400, 178312, 2299200, 30482920, 412420800, 5666482312, 78800938560, 1106532668200

21. The Fibonacci numbers are defined by $a_0 = a_1 = 1$ and

$$
a_k = a_{k-1} + a_{k-2} \quad k \geq 2.
$$

Enter the values for $a[0]$ and $a[1]$ and then use a for...while loop to find the largest Fibonacci number smaller than 100. Suppress printing out of values of $a[k]$ while the loop is running and just display the value of the relevant Fibonacci number after the loop has finished.

Answer: 89

22. A simple iteration procedure with $a_0 = 0$ and $a_{n+1} = \exp(-a_n)$ for $n \geq 0$ is being used to find an approximate solution to the equation $x = e^{-x}$. Use a for...while loop to find the first value of $a_n$ such that $|a_n - a_{n-1}| < 10^{-5}$. Display this value of $a_n$ to 10 significant figures. (See Computing Notes section 2.20.1 for a useful example.) Answer: .5671407814

23. Write a procedure which takes an integer $n$ as input and returns $n^2/9$ if $n$ is divisible by 3 and $(n^2 - 1)/3$ if $n$ is not divisible by 3. Do NOT use the command piecewise. (You can make use of the fact that $n$ is divisible by 3 if and only if $n \mod 3 = 0$.) Apply your procedure to $n = 363$ and $n = 364$.

Answer: 14641, 44165
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 UNSW Blackboard presence, and it is there you should look for course materials or links unless your lecturer tells you otherwise. UNSW Blackboard 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. Some courses may also make use of Maple TA for testing. If you use your own computer to access this system, you should have an up to date browser and java plugin.

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.

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