CONTENTS OF THE
MATH1231/1241 COURSE PACK 2015

Your course pack should contain the following four items:

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

2. Algebra Notes (for MATH1231/1241)

3. Calculus Notes (for MATH1231/1241)

4. Past Exam Papers Booklet

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GENERAL INFORMATION FOR
MATH1231 and MATH1241

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 is a conceded pass or better in either MATH1131 or MATH1141 whilst a distinction, or better, in MATH1131 or a credit or better in MATH1141 is required for enrolment in MATH1241. The exclusions for MATH1231 are:

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

There are corresponding exclusions for MATH1241.

Contacting the Student Services 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 Student Services Office directly. The first year adviser in the Student Services Office is Ms M. Lugton. All administrative enquiries concerning first year Mathematics courses should be sent to Ms Lugton, either:

- by email to fy.MathsStats@unsw.edu.au
- by phone to 9385 7011
- or in person in room RC-3088 (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 Student Services Office. Constructive comments on course improvement may also be emailed to the Director of First Year. 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 Student Services Office.
Lecturers in charge

The course authority for MATH1231/1241 is the Deputy Director of First Year Studies, Jonathan Kress. He can be contacted via email (j.kress@unsw.edu.au). For the Algebra component:

Lecturer-in-charge  Dr. Chi Mak  Room 4073, Red Centre

For the Calculus component:

Lecturer-in-charge  M Pahor  Room 3091, Red Centre

For the Computing component:

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

Lectures

Students in MATH1231 and MATH1241 are generally enrolled in a lecture group, where a lecture group consists of a sequence of two Algebra lectures and two Calculus lectures each week. There are four lecture groups in MATH1231 and two in MATH1241. Lectures commence in week 1 and run until week 12 as indicated in your timetable on myUNSW.

<table>
<thead>
<tr>
<th>Lectures Group 1</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mon 4-5 Alg KBT Murray</td>
<td>5-6 Calc KBT Henry</td>
<td>12-1 Calc KBT Henry</td>
<td>1-2 Alg KBT Murray</td>
<td></td>
</tr>
<tr>
<td>Lectures Group 2</td>
<td>4-5 Alg KBT Usachev</td>
<td>5-6 Calc KBT Pahor</td>
<td>9-10 Calc Mat A Pahor</td>
<td>10-11 Alg Mat A Usachev</td>
<td></td>
</tr>
<tr>
<td>Lectures Group 3</td>
<td>9-10 Alg KBT Chan</td>
<td>10-11 Calc KBT Tisdell</td>
<td>9-10 Calc KBT Tisdell</td>
<td>10-11 Alg KBT Chan</td>
<td></td>
</tr>
<tr>
<td>Lectures Group 4</td>
<td>10-11 Alg KBT Mak</td>
<td>12-1 Calc KBT Ellis</td>
<td>1-2 Calc KBT Ellis</td>
<td>2-3 Alg KBT Mak</td>
<td></td>
</tr>
</tbody>
</table>
It is important to note that:

- **If your timetable requires it, it is possible to take the algebra lectures from one group and the calculus lectures from another group**, but it is not possible to mix calculus lectures from two different groups or algebra lectures from two different groups (because the lecture groups do not keep exactly in step with each other).

- Important announcements and handouts may be given out in lectures, so missing lectures (or even arriving late) may cause significant difficulties for you.

**Tutorials**

Students in MATH1231 are enrolled in two tutorials, one for algebra and one for calculus. The algebra tutorial is timetabled for the second half of the week, whilst the calculus tutorial is scheduled for the first half of the week. For MATH1231 tutorials run every week for both algebra and calculus from Week 2 and Week 13. 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 Student Services Office, RC-3088. To change a tutorial you will need to provide proof of a timetable clash or work commitments.

Note that

- **ALL tutorials commence in week 2 and run until week 13**;

- attendance at tutorials is compulsory and the roll will be called in tutorials;

**MATH1241 Tutorials**

Students in MATH1241 are enrolled in two tutorial time slots, one for algebra and one for calculus. The algebra tutorial is timetabled for the second half of the week, whilst the calculus tutorial is scheduled for the first half of the week. However, the tutorials will only run every second week, except for Test Weeks as shown in the table below. **Please note this table very carefully - especially the weeks when there is a class tests.**
In the weeks you do not have a tutorial you will have Maple-TA exercises to complete. There are 6 sets of exercises for algebra, Weeks 3,5,7,9,11,13 and 6 set of exercises for Calculus, Weeks 2,4,6,8,10,12. The precise schedule is shown later in this document. You should also be watching the MATH1241 Videos which will cover more basic material. Your normal tutorial ROOM will be available to use if you wish (there will of course be no tutor there) in these off-weeks.

There is a detailed week-by-week roster in the Algebra Notes and Calculus Notes and also on Moodle.

UNSW Moodle

The School of Mathematics and Statistics makes extensive use of the centrally provided electronic learning environment known as “UNSW Moodle”.

The URL for UNSW Moodle is

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

ASSESSMENT

Assessment overview

The final raw mark will be made up as follows:

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

Lectures run during weeks 1–12 and tutorials run during weeks 2–13. The table below gives the schedule of class tests, computing assessments and for MATH1231 only, the online algebra and calculus tests TP1, TP2, TP3 and TP4. For MATH1241, there are weekly online homework exercises instead of TP1 to TP4. Details of these can be found on UNSW Moodle.
<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></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<td>3</td>
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<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>TP1*</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>TP2*, Test 1</td>
<td>Test 1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>Online tests 1 and 2 due</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>TP3*</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Test 2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>Mid-semester break</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>TP4*, Test 2</td>
<td></td>
<td>Test in Laboratory</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mid-semester break

End of semester examination — check UNSW exam timetables for details

*The TP online tests are for MATH1231 only. MATH1241 has weekly online homework exercises that are described on UNSW Moodle.

Note that:

- You will **not** be allowed to take a calculator into class tests.

- If you miss a class test due to illness please DO NOT apply for Special Consideration on-line. You should take the appropriate documentation explaining your absence to your tutor as soon as is practicable and an M will be recorded.

- 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 and stats marks” link on the home page of MATH1231 or MATH1241 on the UNSW Moodle 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 Student Services Office as soon as possible but no later than Friday Week 13.

Once the examinations section finalises the examination timetable, you will be able to find out the time and place of the MATH1231/1241 examination from myUNSW. The web page

https://student.unsw.edu.au/exams

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

   https://student.unsw.edu.au/grades

• 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 for MATH1231

Before each 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 conducted using an online testing system called “Maple TA”. Information on how to register for the correct class in Maple TA and how to use the system is provided on Moodle. To access this material and to find the link to UNSW’s Maple TA server, follow the “Maple TA” link on the Moodle homepage of your first year mathematics course.

You can also access the Maple TA login page directly at

   http://mapletap.telt.unsw.edu.au:8443/mapleta

using your zID (z followed by your UNSW student number) as your “User login” and your zPass as the “Password”. You are advised to read the instructions on Moodle before going directly to Maple TA so that you are aware of how you are expected to answer the questions. 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 Week 3</td>
<td>4pm Friday Week 4</td>
</tr>
<tr>
<td>TP2 - Math 1B Algebra online test 1</td>
<td>2pm Monday Week 5</td>
<td>1pm Wednesday Week 6</td>
</tr>
<tr>
<td>TP3 - Math 1B Calculus online test 2</td>
<td>2pm Wednesday Week 7</td>
<td>4pm Friday Week 8</td>
</tr>
<tr>
<td>TP4 - Math 1B Algebra online test 2</td>
<td>2pm Monday Week 11</td>
<td>1pm Wednesday Week 12</td>
</tr>
</tbody>
</table>

Online tutorials for MATH1241

The schedule for the online tutorials for MATH1241 will be given on Moodle.

Notes for both MATH1231 and MATH1241 online tests and exercises

Note:

• 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 day;

• **no additional attempts will be granted.** You have 5 attempts at these tests to allow for technical or other problems that may result in one or more attempts being lost;

• **no deadline extensions will be granted.** You should attempt these tests with sufficient remaining time to allow for unplanned service interruptions.

### Class tests

Details of the dates and content of tests are given on pages 24 and 29 of this booklet. Sample copies of the tests are included in the Algebra and Calculus Notes. 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.

• You will **not** be allowed to use a calculator in class tests.

• Your **best three scores** in the four tests will be counted towards your final assessment mark.

• If you miss a class test due to illness please **DO NOT** apply for Special Consideration on-line. You should take the appropriate documentation explaining you absence to your tutor as soon as is practicable and an M will be recorded.

### Maple Online tests

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 10. 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 should be attempted after completing the corresponding self-paced Maple lesson in UNSW Moodle. Details on using and accessing Maple TA for online tests are on UNSW Moodle. The deadlines for these tests are given below. After a test’s deadline a “revision only” version of the test, that does **not** count towards your final mark, will become available. These online Maple computing tests must be passed in sequence. For example, you must pass “Maple Online Test 1” or “Maple Online Test 1 (revision only)” to gain access to “Maple Online Test 2” and “Maple Online Test 2 (revision only)”.


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.

The deadlines for completion of the online Maple tests for MATH1231 are:

<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 5</td>
</tr>
<tr>
<td>3 and 4</td>
<td>4pm Friday of week 7</td>
</tr>
</tbody>
</table>

The deadlines for completion of the online Maple tests for MATH1241 are:

<table>
<thead>
<tr>
<th>Tests</th>
<th>Due to be completed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>4pm Tuesday of week 5</td>
</tr>
<tr>
<td>3 and 4</td>
<td>4pm Tuesday of week 7</td>
</tr>
</tbody>
</table>

In the tables above and in Maple TA the computing tests numbered 1, 2, 3 and 4 correspond to the Moodle self-paced lessons 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 10 and do not explicitly count towards your final mark. The online self-paced lessons 1 to 7 from MATH1131 and MATH1141 are provided as a revision resource in Moodle. (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.)

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.

Maple Laboratory test

The second form of computing test will be run under exam conditions in the Red-Centre laboratory RC-G012. You must bring your UNSW Student ID card to the test.

Tests will be held in the Red-Centre computer lab G012 at various times during Week 10. You must make a booking to do the test at one of these times. Bookings must be made using the "Maple Lab Test booking" link on Moodle. This should be available by early in week 8 of semester. If you believe that all the proposed times will be impossible for you, inform the Lecturer in Charge of First Year Computing immediately.

The test will be on the features of Maple which are covered in Chapter 1 and Chapter 2 of the First Year Maple Notes 2015.

You will NOT need to remember the exact syntax of each command because you will have access to the following resources during the test:

- a printed paper copy of the First Year Maple Notes,
- a PDF electronic copy of the First Year Maple Notes,
- the self-paced lessons from Moodle and
- Maple’s in built help pages.
You will not have access to the internet during the test and are NOT allowed to bring any
calculators, notes or writing materials (pens, pencils, paper) into the test.

All of the possible test problems are provided in your MATH1231 or MATH1241 Maple TA
class. There you will also find a practice test with the same format as the actual Maple Lab
Test. You are allowed an unlimited number of attempts at the practice tests.

Because you are allowed unlimited practice at the actual test questions and you can view
your results for these tests in the Maple TA gradebook, you are expected to have worked out
exactly how to answer the questions before you attend the test.

End of Semester Examination
The largest component of assessment in MATH1231/1241 is the end of semester examination
which covers material from the whole of the algebra, calculus and computing (Maple) syllabuses.
The exam is arranged and conducted centrally. You will find the time and location of your
exams on myUNSW towards the end of the semester. General information on examinations at
UNSW can be found at

https://student.unsw.edu.au/exams

The best guide to the style and level of difficulty of the final exam is the past exam papers. The
course pack contains a book of past exam papers with worked solutions. To see the exam form
of the past exam papers, including the instructions on the front cover and the tables of integrals
and standard normal probabilities that are provided, search for “MATH1231” or “MATH1241”
on the library website.

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.

Please note that the Algebra syllabus changed in 2012. Chapter 9, on Statistics and Prob-
ability was been rewritten and contains some material that is different from previous years.
Please note this carefully when you are looking at past exams and revising.

Important information on special consideration for the final exam can be found
on page 18.

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, obtain-
able 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://student.unsw.edu.au/exams

COURSE MATERIALS

The course materials consist of the course pack, the textbook and the online self-paced
maple lessons. In addition, lecturers may provide notes on UNSW Moodle to accompany their
lectures.
Course Pack

Your course pack should contain the following four items:

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

2. Algebra Notes (for MATH1231/1241)

3. Calculus Notes (for MATH1231/1241)

4. Past Exam Papers Booklet

You should also have the First Year Maple Notes from the MATH1131/MATH1141 course pack. This can also be downloaded from UNSW Moodle.

Textbook


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.

Online Self-Paced Maple Lesson

In addition to the Calculus and Algebra components, there is a Computing component in MATH1231/1241. 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 lessons are available in UNSW Moodle. These lessons 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 lessons according to the schedule given on page 10. Associated with each lesson 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 10.

More information about the Computing component is given later in this booklet (see pages 10 and 30) and in the booklets Computing Laboratories Information and First Year Maple Notes 2015. These computing notes are freely available from the MATH1231/1241 page on UNSW Moodle, and also from the School’s website.

GETTING HELP OUTSIDE TUTORIALS
Staff consultations

From week 3 there will be 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). It is also available from the web page

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

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 SSS office is located in RC-3064. During semester the SSS has opening times from 10am–12noon and 1pm–3pm from Mondays to Fridays. The First Year courses the SSS services in semester 2 will be MATH1011, MATH1041, MATH1131, and MATH1231. The schedule will be available on the SSS website at

http://www.maths.unsw.edu.au/currentstudents/student-support-scheme

by the end of Week 1. Please remember that there is no appointment needed. Just drop-in and you will be able to obtain one-on-one help from SSS tutors.

Maple Lab Consultants

For help with the Maple computing component of this course, consultants will be available in the Red-Centre lab RC-G012B from 11am to 4pm each teaching day in weeks 1 to 9. For more details see

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

FURTHER INFORMATION

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 Guide. 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 MATH1231, MATH1241 and MATH1251 2015”. A copy of this document is included in this booklet on page 18. 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 arrive too late to be admitted to the end of semester exam, go immediately to the Mathematics and Statistics Student Services Office, Room 3088, Red Centre.

Course Aims

The aim of MATH1231/1241 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.

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/currentstudents/assessment-policies

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

Summer session MATH1231

If your provisional mark in MATH1231 or MATH1241 does NOT indicate a clear pass, and if this course is compulsory for your program and you wish to complete your degree in minimum time, you are advised to enrol immediately in summer session MATH1231, even if you expect to be granted additional assessment in the semester two 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 MATH1131 or MATH1141. If they cannot help you, try your lecturers or one of the two Lecturers-in-charge (their names and room numbers are shown on page 4 of this booklet). If your problems are more serious, or haven’t been resolved to your satisfaction, come to see me (Peter Brown) in Room 3073, 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 Student Information web page, available from the home page of myUNSW.

Peter Brown
Director of First Year Studies
School of Mathematics and Statistics
fy.MathsStats@unsw.edu.au
ADDITIONAL INFORMATION FOR
MATH1241 HIGHER MATHEMATICS 1B

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

Content

Higher Mathematics 1B includes everything which is in MATH1231 Mathematics 1B and this accounts for 85% of the content of the Higher subject. The remaining time is spent treating some of the common topics in greater depth and covering some extra topics. This booklet contains separate Calculus syllabuses for MATH1231 and MATH1241. For Algebra there is a syllabus for MATH1231 and a list of extra topics for MATH1241.

Problem sets

The basic problem sets for MATH1241 are the same as for MATH1231, but you should pay special attention to the problems labelled [H] and [X] because they are particularly intended for students in the Higher subject. At the same time, it is important that you work through all the [R] labelled questions to make sure that you get adequate practice on more routine problems. It is possible that some additional problem sheets may be issued for Higher students.

Assessment

All grades from High Distinction to Fail are awarded in both MATH1231 and MATH1241. Marks in Higher Mathematics 1B will be scaled so that students in the Higher subject are not at any disadvantage compared to students in the ordinary course MATH1231. The online preparation tests, class tests and computing tests for MATH1241 are the same as those for MATH1231. However, the MATH1241 end of semester exam will contain questions that are quite different from those in the MATH1231 exam. From 2013 on, there will be, at most, two complete questions common to the MATH1231 and MATH1241 exam, rather than one.

Online Tutorials

In MATH1241, classroom tutorials alternate with online tutorials according to the schedule given elsewhere in this booklet. The homework exercises on Maple TA associated with these online tutorials replace the online algebra and calculus tests in MATH1231.
APPLICATIONS FOR SPECIAL CONSIDERATION IN
MATH1231, MATH1241 AND MATH1251 SEMESTER 2 2015

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 rules 1, 2, 5 and 6, which apply to applications for special consideration in all first year Mathematics courses. Rules 3 and 4 apply to the above courses only.

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 ON-LINE.**
   
   Please refer to link below for How to Apply for Special Consideration,
   
   https://student.unsw.edu.au/special-consideration

2. **Please do not expect an immediate response from the School.** All applications will be considered together. See the information below.

3. If you miss a **class test** due to illness or other problems, then you should provide the appropriate documentation to your **tutor** who will record an M. **DO NOT** apply on-line for special consideration for class tests or for on-line or computing tests.

4. If your course involves a MAPLE/MATLAB lab test which you miss, you should contact the lecturer in charge of computing as soon as possible. A resit will be organised for later in the session.

5. **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 greater than 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.

6. **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 and final list of grants of additional assessment is planned to be made available via the “Maths and Stats Marks” link in the UNSW Moodle module for your course late on **Friday 27th November.**

   b) **On Monday 30th November 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.**

7. The **timetables** for the additional assessment examinations will be available on the Mathematics website at the same time as the provisional list of results.

   For details regarding the Semester 2 additional assessment examinations for the above course please see the School Web Page.
8. 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.

9. 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 3073 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](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 B. Henry  
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 contributed\(^2\).

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.

\(^1\)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 both MATH1231 and MATH1241 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. MATH1241 lecturers will include extra material in their lectures. 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 and continuous valued random variables and their associated probability distributions. The main distributions studied are the binomial and geometric in the discrete case, and the normal distribution in the continuous case. These are applied to solving a range of problems.
Lecture 16. Revision of set theory (9.1), Mathematical probability (9.2.1, 9.2.2).
Lecture 17. Conditional probability, Bayes’ rule, statistical independence (9.2.3, 9.2.4)
Lecture 18. Random variables, discrete random variables, mean of a discrete random variable (9.3.2)
Lecture 19. Variance of a discrete random variable (9.3.2), special distributions, the binomial distribution (9.4.1)
Lecture 20. Geometric distribution, sign test, (9.4.2, 9.4.3)
Lecture 21. Continuous random variables (9.5)
Lecture 22. The Normal distribution, approximations to the binomial distribution. (9.6)
Lecture 23. Review.

EXTRA ALGEBRA TOPICS FOR MATH1241

The extra topics in the MATH1241 syllabus, marked [X] in the notes will be selected from the following:
Vector spaces. Matrices, polynomials and real-valued functions as vector spaces (6.8). Coordinate vectors (6.7). The theoretical treatment of vector spaces in MATH1241 will be at a slightly more sophisticated level than that in MATH1231.
Linear transformations. Linear maps between polynomial and real-valued function vector spaces (7.5). Matrix representations for non-standard bases in domain and codomain (7.6). Matrix arithmetic and linear maps (7.7). Injective, surjective and bijective linear maps (7.8). Proof the rank-nullity theorem (7.9).
Eigenvalues and eigenvectors. Markov Chain Processes (8.3.3). Eigenvalues and eigenvectors for symmetric matrices and applications to conic sections.
Probability and statistics. The Exponential distribution (9.6.2).

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]. Problems marked with [V] have a video solution available via Moodle. You do need to make an attempt at the [H] problems because problems of this type will occur on tests and in the exam. If you have difficulty with the [H] problems, ask for help in your tutorial.

The problems marked [X] are intended for students in MATH1241 – they relate to topics which are only covered in MATH1241.

Extra problem sheets for MATH1241 may be issued in lectures.

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.

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.

**MATH1231 WEEKLY SCHEDULE**

<table>
<thead>
<tr>
<th>Week</th>
<th>Algebra problems</th>
<th>Homework</th>
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<tbody>
<tr>
<td></td>
<td>Chapter</td>
<td>Problems up to</td>
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<tr>
<td>1</td>
<td>No tutorial, but try the revision questions</td>
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<td>2</td>
<td>6</td>
<td>14</td>
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<td>3</td>
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<td>6</td>
<td>7</td>
<td>23 (Test 1)</td>
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<td>11</td>
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<tr>
<td>12</td>
<td>9</td>
<td>40 (Test 2)</td>
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<tr>
<td>13</td>
<td>9</td>
<td>65</td>
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MATH1241 WEEKLY SCHEDULE.

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<thead>
<tr>
<th>week</th>
<th>location</th>
<th>Try to do up to</th>
<th>Questions</th>
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<tr>
<td></td>
<td></td>
<td>chapter</td>
<td>problem</td>
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<tr>
<td>1</td>
<td>None</td>
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<tr>
<td>2</td>
<td>Online</td>
<td>6</td>
<td>18</td>
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<td>3</td>
<td>Classroom</td>
<td>6</td>
<td>33</td>
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<td>4</td>
<td>Online</td>
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<td>13</td>
<td>Classroom</td>
<td>9</td>
<td>66</td>
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</tbody>
</table>

CLASS TESTS AND EXAMS

Questions for the class tests in MATH1231 and MATH1241 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).

Please note that the Algebra syllabus changed in 2012. Chapter 9, on Statistics and Probability was been rewritten and contains some material that is different from previous years. Please note this carefully when you are looking at past exams and revising.

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 in week 6 and will be based on the suggested problems from for weeks 2 to 5.

**Algebra class test 2** will be given in week 12 and will be based on the suggested problems for weeks 6 to 11.
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.

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.

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.
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.

<table>
<thead>
<tr>
<th>Section</th>
<th>Time</th>
<th>SH8</th>
<th>SH10</th>
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</thead>
<tbody>
<tr>
<td>1. Functions of several variables. (3 hours)</td>
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<tr>
<td>Contours and level curves, partial derivatives.</td>
<td>14.1-14.4</td>
<td>15.1-15.4</td>
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<tr>
<td>Mixed derivative theorem, increment estimation.</td>
<td>14.6</td>
<td>15.6</td>
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<tr>
<td>Chain rules, tangent planes.</td>
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<tr>
<td>2. Integration techniques. (4 hours)</td>
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<tr>
<td>Trigonometric integrals and reduction formulae.</td>
<td>8.3</td>
<td>8.3</td>
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<tr>
<td>Trigonometric and hyperbolic substitutions.</td>
<td>8.4</td>
<td>8.4</td>
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<tr>
<td>Rational functions and partial fractions.</td>
<td>8.5</td>
<td>8.5</td>
<td></td>
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<tr>
<td>Further substitutions.</td>
<td>8.6</td>
<td>8.6</td>
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<tr>
<td>3. Ordinary differential equations. (6 hours)</td>
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<tr>
<td>Particular, general, explicit and implicit solutions.</td>
<td>18.1</td>
<td></td>
<td></td>
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<tr>
<td>1st order equations: separable, linear, exact.</td>
<td>8.9, 18.2, 9.1, 9.2, 15.9</td>
<td>19.1, 19.2</td>
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<tr>
<td>Modelling with odes</td>
<td></td>
<td>9.1, 9.2</td>
<td></td>
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<tr>
<td>2nd order linear equations with constant coeffts: homogeneous, non-homogeneous (undetermined coeffts).</td>
<td>18.3, 18.4</td>
<td>9.3, 19.4</td>
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<tr>
<td>4. Taylor series. (7 hours)</td>
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<tr>
<td>Taylor polynomials, Taylor’s theorem.</td>
<td>11.5</td>
<td>12.6, 12.7</td>
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<tr>
<td>Application to stationary points.</td>
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<tr>
<td><strong>Sequences</strong>: convergence and divergence; combination of sequences.</td>
<td>10.2, 10.3</td>
<td>11.2-11.4</td>
<td></td>
</tr>
<tr>
<td><strong>Series</strong>: partial sums; convergence; kth term test for divergence; integral, comparison and ratio tests; alternating series (Leibniz’ test); absolute and conditional convergence; rearrangement of series.</td>
<td>11.1, 11.2</td>
<td>12.1, 12.2</td>
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<tr>
<td></td>
<td>11.1-11.3</td>
<td>12.3, 12.4</td>
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<td>11.4</td>
<td>12.5</td>
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<tr>
<td>Taylor and Maclaurin series.</td>
<td>11.6</td>
<td>12.7</td>
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</tr>
<tr>
<td><strong>Power series</strong>: radius and interval of convergence; operations on power series.</td>
<td>11.7, 11.8</td>
<td>12.8, 12.9</td>
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<tr>
<td>5. Applications of integration. (3 hours)</td>
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<tr>
<td>Average value of a function.</td>
<td>5.8</td>
<td>5.9</td>
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</tr>
<tr>
<td>Arc length.</td>
<td>9.8</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Arc length in polar coordinates.</td>
<td>9.5, 9.8</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Area of surfaces of revolution.</td>
<td>9.9</td>
<td>10.8</td>
<td></td>
</tr>
</tbody>
</table>
CALCULUS SYLLABUS FOR
MATH1241 HIGHER MATHEMATICS 1B

This is the syllabus for *Higher* 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 subject 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 under SH8 and SH10 and references to *Calculus* by M. Spivak under Sp.

<table>
<thead>
<tr>
<th>Section</th>
<th>SH8</th>
<th>SH10</th>
<th>Sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Functions of several variables. (3 hours)</td>
<td>14.1-14.4</td>
<td>15.1-15.4</td>
<td>14.6</td>
</tr>
<tr>
<td>Contours and level curves, partial derivatives.</td>
<td></td>
<td></td>
<td>15.6</td>
</tr>
<tr>
<td>Mixed derivative theorem, increment estimation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain rules, tangent planes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Integration techniques. (4 hours)</td>
<td>8.3</td>
<td>8.3</td>
<td>18</td>
</tr>
<tr>
<td>Trigonometric integrals and reduction formulae.</td>
<td>8.4</td>
<td>8.4</td>
<td>18</td>
</tr>
<tr>
<td>Trigonometric and hyperbolic substitutions.</td>
<td>8.5</td>
<td>8.5</td>
<td>18</td>
</tr>
<tr>
<td>Rational functions and partial fractions.</td>
<td>8.6</td>
<td>8.6</td>
<td>18</td>
</tr>
<tr>
<td>Further substitutions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ordinary differential equations. (6 hours)</td>
<td>18.1</td>
<td>9.1, 9.2, 15.9, 19.1, 19.2</td>
<td></td>
</tr>
<tr>
<td>Particular, general, explicit and implicit solutions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st order equations: separable, linear, exact.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modelling with odes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd order linear equations with constant coeffts: homogeneous, non-homogeneous (undetermined coeffts).</td>
<td>18.3, 18.4</td>
<td>9.3, 19.4</td>
<td></td>
</tr>
<tr>
<td>4. Taylor series. (7 hours)</td>
<td>11.5</td>
<td>12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Taylor polynomials, Taylor’s theorem.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application to stationary points.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequences: convergence and divergence; combination of sequences.</td>
<td>10.2, 10.3</td>
<td>11.2-11.4</td>
<td>21</td>
</tr>
<tr>
<td>Upper, lower bounds, sup and inf, bounded monotonic sequences.</td>
<td>10.1-10.3</td>
<td>11.1</td>
<td>8, 21</td>
</tr>
<tr>
<td>Recursively defined sequences.</td>
<td>10.2</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Series: partial sums; convergence; kth term test for convergence; comparison, integral, ratio and root tests; alternating series (Leibniz’ test); absolute and conditional convergence; rearrangement of series.</td>
<td>11.1, 12.1, 12.2</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Taylor and Maclaurin series.</td>
<td>11.6</td>
<td>12.7</td>
<td>19</td>
</tr>
<tr>
<td>Power series: radius and interval of convergence; operations on power series.</td>
<td>11.7, 11.8</td>
<td>12.8, 12.9</td>
<td>23</td>
</tr>
<tr>
<td>5. Applications of integration. (3 hours)</td>
<td>5.8</td>
<td>5.9</td>
<td></td>
</tr>
<tr>
<td>Average value of a function.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arc length in Cartesian and polar coordinates.</td>
<td>9.5, 9.8</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Area of surfaces of revolution.</td>
<td>9.9</td>
<td>10.8</td>
<td></td>
</tr>
</tbody>
</table>
PROBLEM SETS

The Calculus problems are located at the end of each chapter of the Calculus Notes booklet. 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 \([X]\). Problems marked with \([V]\) have a video solution available on Moodle.

PROBLEM SCHEDULE

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.

Students in MATH1241 should do the minimal set of homework questions and some of the \([H]\) and \([X]\) problems as well.

MATH1231 WEEKLY SCHEDULE

<table>
<thead>
<tr>
<th>Week</th>
<th>Calculus problems</th>
<th>Homework Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chapter</td>
<td>Problems up to</td>
</tr>
<tr>
<td>1</td>
<td>No tutorial.</td>
<td>1(c), 3(c), 4(d)</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
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<tr>
<td>3</td>
<td>1</td>
<td>17</td>
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<td>5</td>
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<td>4</td>
<td>2</td>
<td>17</td>
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<td></td>
<td>3</td>
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<tr>
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<td>4</td>
<td>18</td>
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<td></td>
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<td>8</td>
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<td>32</td>
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<tr>
<td>11</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>49</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>13</td>
</tr>
</tbody>
</table>
**MATH1241 WEEKLY SCHEDULE.**

<table>
<thead>
<tr>
<th>Tutorial</th>
<th>Try to do up to</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>week</td>
<td>location</td>
<td>chapter</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Classroom</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Online</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Classroom</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Classroom</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Classroom</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Online</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Classroom</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Classroom</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Classroom</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Online</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Classroom</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Online</td>
<td>5</td>
</tr>
</tbody>
</table>

**CLASS TESTS AND EXAMS**

Questions for the class tests in MATH1231 and MATH1241 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 Calculus Notes). The Calculus class tests will take place in tutorials in the following weeks:

**Test 1** Week 5

**Test 2** Week 9

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 2.3</td>
<td>Chapter 1 and Q1–Q16 in chapter 2</td>
</tr>
<tr>
<td>2</td>
<td>Chapter 2.4–2.5 and all of chapter 3</td>
<td>Q17–Q22 in chapter 2 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.
COMPUTING INFORMATION

How much?
In MATH1231/1241 there are online computing tests worth 4% of your final mark and there will be a laboratory test, in week 10 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 semester 2 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>9 am to 9 pm</td>
<td>9 am to 9 pm</td>
</tr>
<tr>
<td><strong>Week 10 and Monday of Week 11:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturdays, Sundays</td>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>During holidays:</td>
<td>9 am to 9 pm</td>
<td>Closed</td>
</tr>
<tr>
<td>Public holidays and Weekends</td>
<td>Closed</td>
<td>Closed.</td>
</tr>
</tbody>
</table>

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.
Remote Access

All of the software that you need for this course is installed on the computers in the Red-Centre labs. This software can also be accessed from your own computer. For information on accessing Mathematical and Statistical software from outside the Red-Centre labs, please see the information provided on this course’s page in UNSW Moodle.

Accounts and passwords

If you had an account for computers in the Mathematics Labs in semester 1, you will continue to use the same account with the same password in semester 2. 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 2015 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

In MATH1231/1241 you are expected to know all of the Maple material from MATH1131/1141. The Maple computing component for MATH1231/1241is taught via a series of self-paced lessons located in UNSW Moodle. You are expected to work steadily through these lessons, completing the test in Maple TA at the end of each module before moving on to the next module. The timetable for the completion of these small tests is explained in detail in the section on Computing tests on page 9 and is clearly visible in Maple TA.

The online teaching package for MATH1231/1241 consists of the following lessons:

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


Lesson 10 Further linear algebra: matrix operations and properties, nullspace, kernel, rank, nullity, eigenvalues and eigenvectors.

Lesson 11 Geometry: dot and cross products, the geom3d package and its use.

Lesson 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 will be heavily used this year as there are about 4000 students with accounts. Queues will develop at peak times such as when assignments (in other courses) 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 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 Maple Online Tests on Maple TA and the Maple Laboratory Test. The details of these Maple tests have been described previously in the section on Computing tests on page 9. Note that, 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 miss the Maple Lab Test due to illness or another unexpected reason outside of your control, you must contact Ms Lugton in RC-3088 as soon as possible and provide a medical certificate or other appropriate documentation. An additional test will be arranged during week 11 or 12 for students who provide suitable documentation. If you know in advance of week 10 that you will not be able to sit the test at one of the scheduled times, you must contact Dr Jonathan Kress in RC-4102 as early as possible and a test may be arranged before week 10. 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.

Dr Jonathan Kress (Room: Red Centre 6111)
Lecturer in Charge
First Year Computing
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 Moodle presence, and it is there you should look for course materials or links unless your lecturer tells you otherwise. UNSW Moodle 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.

<table>
<thead>
<tr>
<th>Name</th>
<th>Lower case</th>
<th>Upper case</th>
<th>Name</th>
<th>Lower case</th>
<th>Upper case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>α</td>
<td></td>
<td>Nu</td>
<td>ν</td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>β</td>
<td></td>
<td>Xi</td>
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<tr>
<td>Gamma</td>
<td>γ</td>
<td>Γ</td>
<td>Pi</td>
<td>π</td>
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</tr>
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<tr>
<td>Eta</td>
<td>η</td>
<td></td>
<td>Phi</td>
<td>φ or ϕ</td>
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<tr>
<td>Theta</td>
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<td>Chi</td>
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