CONTENTS OF THE
MATH1131/1141 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 MATH1131/1141)
3. Calculus Notes (for MATH1131/1141)
4. Past Exam Papers Booklet
5. First Year Computing Notes

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GENERAL INFORMATION FOR
MATH1131 and MATH1141

Background

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

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

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

For the excluded courses for MATH1141 replace MATH1141 by MATH1131.

Assumed Knowledge

The assumed knowledge for MATH1131 is a mark of at least 100 on the NSW HSC Mathematics Extension 1 course. However, students with marks below 120 are advised that they will need work especially conscientiously. MATH1131 is also an appropriate course for those students who only attempted the NSW HSC 2 Unit Mathematics course (Calculus based) and who attained a mark of at least 90. Students who attained a mark below 80 in that course are likely to find MATH1131 very difficult.

Students with a Mathematics Extension 2 combined mark above 176 or an Extension 1 combined mark above 145 are encouraged to enrol in MATH1141, which is the higher version of MATH1131.

Please note that although some Distinctions and High Distinctions are awarded to MATH1131 students, if you satisfy the criteria above and are seeking very high grades you should consider taking MATH1141.

Assumed Knowledge Quiz (MATH1131 ONLY)

There will be an on-line test on Assumed Knowledge in Week 2 for MATH1131. This should give you some clear indication as to how prepared you are for this course. Revision problems for this quiz appear at the beginning of the Calculus Notes. You may care to work through these before attempting the on-line quiz. Students who only studied 2 Unit Mathematics at high school and who did not take the Bridging Course will find this test difficult since it contains material from the HSC Extension 1 course. There will be some brief notes available on Moodle to supplement the revision problems and you will need to learn this material independently. We will take the best 4 of 5 on-line tests.

There is NO Assumed Knowledge Quiz in for MATH1141 students.

See below under On-line Algebra and Calculus Tests.

If you feel after two weeks of semester that MATH1131 is too demanding for you, then you should seek advice from the Student Services Office, RC-3090.
Lecturers in charge

The course authority for MATH1131/1141 is the Director of First Year Studies, Peter Brown. He can be contacted via the Student Services Office. Other staff take responsibility for parts of the course as given below.

For the Algebra component:

Lecturer-in-charge    Dr. T. Britz    Room 5111, Red Centre

For the Calculus component:

Lecturer-in-charge    Dr. A. Coster    Room 2086, Red Centre

For the Computing component:

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

Lectures

Students in MATH1131 and MATH1141 are generally enrolled in a lecture group, where a lecture group consists of a sequence of two Algebra lectures and two Calculus lectures each week. There are four lecture groups in MATH1131 and two in MATH1141. 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>9-10 Alg</td>
<td>Mat A</td>
<td>4-5 Calc</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Tisdell</td>
<td>KBT</td>
<td>Coster</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-11 Calc</td>
<td>Mat A</td>
<td>5-6 Alg</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Coster</td>
<td>Tisdell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectures Group 2</td>
<td>12-1 Alg</td>
<td>Mat A</td>
<td>10-11 Calc</td>
<td>Mat A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Brown</td>
<td>KBT</td>
<td>Angell</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-2 Cal</td>
<td>Mat A</td>
<td>11-12 Alg</td>
<td>Mat A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Angell</td>
<td>Brown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectures Group 3</td>
<td>9-10 Alg</td>
<td>KBT</td>
<td>10-11 Calc</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>KBT</td>
<td>Lerner</td>
<td>McDougall</td>
<td>McDougall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-11 Calc</td>
<td>KBT</td>
<td>10-11 Alg</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>McDougall</td>
<td>Lerner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectures Group 4</td>
<td>4-5 Alg</td>
<td>Mat A</td>
<td>1-2 Calc</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Britz</td>
<td>KBT</td>
<td>Meagher</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-6 Calc</td>
<td>Mat A</td>
<td>2-3 Alg</td>
<td>KBT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mat A</td>
<td>Meagher</td>
<td>Britz</td>
<td></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.

**MATH1131 Tutorials**

Students in MATH1131 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 MATH1131 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-3090. 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;

**MATH1141 Tutorials**

Students in MATH1141 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 a MAPLE-TA test to complete. There are 6 tests for algebra, Weeks 3,5,7,9,11,13 and 6 tests for Calculus, Weeks 2,4,6,8,10,12. The precise schedule is shown later in this document. You should also be watching the MATH1141 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.

**Contacting the Student Services Office**

The School of Mathematics and Statistics web-site

[http://www.maths.unsw.edu.au](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.

In particular, the URL


provides a range of menus to choose from.

The student administration officer for First Year in the Student Services 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-3090

**UNSW Moodle**

The School of Mathematics and Statistics uses the Learning Management System called Moodle. To log in to Moodle use your zID and zPass at the following URL:

[http://moodle.telt.unsw.edu.au](http://moodle.telt.unsw.edu.au)
Assessment

The final raw mark will be made up as follows:

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

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 & Stats marks” link on the home page of MATH1131 or MATH1141 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 UNSW examinations section finalises the examination timetable, you will be able to find out the time and place of the MATH1131/1141 examination from myUNSW. The web page

  https://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 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 MATH1131

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. **You should do this in Week 1.** These tests are accessed via the web page

https://mapleta.telt.unsw.edu.au
where your “User login” is z followed by your UNSW student number and the “Password” is your zPass. You will also be required to do an ASSUMED KNOWLEDGE QUIZ (AKQ), which will count as part of the on-line tests. This test will be based on the revision problems in the Calculus Problem booklet. If you do not score at least 6 out 10 on this quiz you should speak to the Director of First Year about your options. The quiz will be available in Week 1 and will need to be completed by Wednesday of Week 3 The schedule for these online tests for MATH1131 is given below.

<table>
<thead>
<tr>
<th>Test</th>
<th>Available</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKQ - Assumed Knowledge Quiz</td>
<td>Monday</td>
<td>1pm Wednesday</td>
</tr>
<tr>
<td></td>
<td>Week 1</td>
<td>Week 3</td>
</tr>
<tr>
<td>TP1 - Math 1A Calculus online test 1</td>
<td>2pm Wednesday</td>
<td>4pm Friday</td>
</tr>
<tr>
<td></td>
<td>Week 3</td>
<td>Week 4</td>
</tr>
<tr>
<td>TP2 - Math 1A Algebra online test 1</td>
<td>2pm Monday</td>
<td>1pm Wednesday</td>
</tr>
<tr>
<td></td>
<td>Week 5</td>
<td>Week 6</td>
</tr>
<tr>
<td>TP3 - Math 1A Calculus online test 2</td>
<td>2pm Wednesday</td>
<td>4pm Friday</td>
</tr>
<tr>
<td></td>
<td>Week 7</td>
<td>Week 8</td>
</tr>
<tr>
<td>TP4 - Math 1A Algebra online test 2</td>
<td>2pm Monday</td>
<td>1pm Wednesday</td>
</tr>
<tr>
<td></td>
<td>Week 11</td>
<td>Week 12</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 25 and 31.

Detailed information on how to use the online testing system is available from the MATH1131 course module on UNSW Moodle in the MATH1131 Mathematics 1A Maple TA 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 5 attempts at the AKQ and each online algebra and calculus test but only your best mark for each test will count. Then, the best 4 of these 5 marks will contribute up to 4% of your final grade.

Note:

- the first test becomes available on Monday of Week 1;
- 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.
Online tutorials for MATH1141

The schedule for the online tutorials for MATH1141 is given below.

<table>
<thead>
<tr>
<th>Online tutorial</th>
<th>Open</th>
<th>Close</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra week 2</td>
<td>Monday week 2</td>
<td>11:59pm Sunday before week 4</td>
</tr>
<tr>
<td>Calculus week 3</td>
<td>Monday week 3</td>
<td>11:59pm Sunday before week 5</td>
</tr>
<tr>
<td>Algebra week 4</td>
<td>Monday week 4</td>
<td>11:59pm Sunday before week 6</td>
</tr>
<tr>
<td>Calculus week 5</td>
<td>Monday week 5</td>
<td>11:59pm Sunday before week 7</td>
</tr>
<tr>
<td>Algebra week 6</td>
<td>Monday week 6</td>
<td>11:59pm Sunday before week 8</td>
</tr>
<tr>
<td>Calculus week 7</td>
<td>Monday week 7</td>
<td>11:59pm Sunday before week 9</td>
</tr>
<tr>
<td>Algebra week 8</td>
<td>Monday week 8</td>
<td>11:59pm Sunday before week 10</td>
</tr>
<tr>
<td>Calculus week 9</td>
<td>Monday week 9</td>
<td>11:59pm Sunday before week 11</td>
</tr>
<tr>
<td>Algebra week 10</td>
<td>Monday week 10</td>
<td>11:59pm Sunday before week 12</td>
</tr>
<tr>
<td>Calculus week 11</td>
<td>Monday week 11</td>
<td>11:59pm Sunday before week 13</td>
</tr>
<tr>
<td>Algebra week 12</td>
<td>Monday week 12</td>
<td>11:59pm Sunday following week 13</td>
</tr>
<tr>
<td>Calculus week 13</td>
<td>Monday week 13</td>
<td>11:59pm Sunday following week 13</td>
</tr>
</tbody>
</table>

Each online tutorial has 4 videos on Moodle corresponding to 4 online homework exercises on Maple TA, each of which consists of 5 questions. You will be allowed 5 attempts at each online homework exercise but only your best mark for each will count. The best scores for these 4 online homework exercises will be summed to give your mark for that online tutorial. Then, the best 8 of these 12 marks will contribute up to 4% of your final grade.

**Note:**

- Each online tutorial should take about 2 hours;
- the first online tutorial will be available from Monday of Week 2;
- except for the calculus week 13 online tutorial, each online tutorial will be available for 2 teaching weeks;
- the calculus week 13 online tutorial will be available for only one teaching week;
- each attempt at these homework exercises must be your own work, but you are encouraged to discuss the methods required with other students;
- each version of a homework exercise will be slightly different, so don’t just copy answers from one attempt to the next;
- only a limited number of users can have simultaneous access to Maple TA, so do NOT leave your attempts at these homework exercises to the last day;
- **no additional attempts will be granted.** You have 5 attempts at these homework exercises 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 homework exercises with sufficient remaining time to allow for unplanned service interruptions.
Class tests

Details of the dates and content of tests are given on pages 25 and 31 of this booklet.

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).

- 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.

Computing tests

There will be two different forms of computing tests. An initial set of five 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 are linked to the self-paced Maple instruction modules in UNSW Moodle. Details on using Maple TA for online tests have been given on page 8. 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.

The deadlines for completion of the online Maple tests for MATH1131 are:

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

The deadlines for completion of the online Maple tests for MATH1141 are:

<table>
<thead>
<tr>
<th>Tests</th>
<th>Due to be completed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2 and 3</td>
<td>4pm Wednesday of Week 5</td>
</tr>
<tr>
<td>4 and 5</td>
<td>4pm Wednesday of Week 7</td>
</tr>
</tbody>
</table>
The additional Maple modules 6 and 7 are designed to assist you with preparation for the Maple laboratory test in week 10. There are online tests within Maple TA corresponding to modules 6 and 7, but these do not count towards your MATH1131/1141 assessment and are for self-testing purposes only.

The second form of computing test will be run under exam conditions in the School’s laboratories. You must book for the test through the School’s Student Web Portal, accessible via the “Maths & Stats marks” link on Moodle, and you must bring your UNSW Student ID card to the test.

Details of the laboratory test are given on page 36. There will also be a practice test available in Maple TA from no later than the start of week 6.

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.
SCHEDULE OF ALL CLASS ASSESSMENTS FOR MATH1131

Lectures run in weeks 1–12 and tutorials run weeks 2–13. The table below gives the schedule of class tests, online tutorial preparation tests and computing assessments.

<table>
<thead>
<tr>
<th>Week</th>
<th>Algebra</th>
<th>Calculus</th>
<th>Computing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Assumed</td>
<td>Online tests 1, 2 and 3 due</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Knowledge Quiz</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Test 1, TP2</td>
<td>TP1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Test 1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Test 2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>TP3</td>
<td>Online tests 4 and 5 due</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Test 2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Online tests 4 and 5 due</td>
<td>Test in Laboratory</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10</td>
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<tr>
<td>11</td>
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<td></td>
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<tr>
<td>12</td>
<td>TP4, Test 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

End of semester examination — check UNSW exam timetables for details

Computing and self-paced online Modules

In addition to the Calculus and Algebra components, there is a Computing component in MATH1131/1141. This is partly interwoven with the Calculus and Algebra components and partly independent of them. To assist in the self-directed learning of this component of the course, online self-paced learning modules are available in UNSW Moodle. 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.

There will be introductory instructional videos, again available in UNSW Moodle.

Students are then expected to work through and complete the specified online modules as detailed on page 10. Associated with each module is a graded quiz and the completed quizzes contribute 4% to the final grade. These modules are integrated with, and enhance the lecture and tutorial content presented in Calculus and Algebra. Learning content will be accessible at all times for learning and revision, but 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 32) and in the booklets Computing Laboratories Information for Students and First Year Maple Notes 2015.

These computing notes are freely available from the MATH1131/1141 module on UNSW Moodle, and also on the computers in the mathematics computing laboratories.
Computing consultants are available in laboratory RC-G012 from 12noon to 4pm every weekday during weeks 1 to 9.

**Course Materials**

The course materials for MATH1131/1141 are:

- **MATH1131/1141 Course Pack 2015.**
- **Computing Laboratories Information for Students 2015;**
- **First Year Maple Notes 2015.**


The latest edition of the textbook, Salas, Hille and Etgen *Calculus - One and Several Variables*, 10th Edition comes packaged with access to the electronic resources known as WileyPlus. This electronic version provides internet access to the textbook, problems, worked solutions, tests (for self-assessment) and other electronic resources related to the text material. The purchase of the text from the UNSW Bookshop gives web access to the WileyPlus server for one year; it is possible to renew the web access on a yearly basis at a fee determined by the publisher. It is also possible to purchase just the web access to the electronic version of the textbook for one year. This can also be done at the UNSW Bookshop. Note that these WileyPlus electronic resources are provided by the publisher John Wiley, and not by the School of Mathematics and Statistics. Any difficulties that you might have with access to WileyPlus must be resolved directly with the publisher.

- Salas, Hille & Etgen is sold at the UNSW Bookshop.
- The Course Pack contains the following items:
  - *Information Booklet that you are now reading;*
  - *Algebra Notes (for MATH1131/1141);*
  - *Calculus Notes*

**Getting help outside tutorials**

From week 3 there is a roster which shows for each hour of the week a list of names of members of staff who are available at that time to help students in first year mathematics courses. This roster is displayed on the same noticeboard as timetables, near the School Office (Room 3070, Red Centre) and also outside the Student Services Office (Room 3090, 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 schedule will be available on the SSS website at
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.

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

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

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:


Illness and other problems

If you are ill for the final examination you can apply for Special Consideration and you may be offered the opportunity for Additional Assessment.

Please do NOT apply on-line for Special Consideration for class tests or on-line quizzes.

In order to be offered Additional Assessment it is essential that you

follow exactly the procedures set out in the document entitled “Application for Special Consideration in First Year Mathematics Courses Semester 1 2015.”

A copy of this document is included in this booklet on page 18.

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, however it is unlikely that more than 2 medical certificates will be taken into account.
• Transport delays and oversleeping will not be accepted as reasons for missing class tests. (But note that only your best three test results are counted for assessment.)

• Because it is possible to sit the computing tests on many days, medical certificates will generally not be accepted as excuses for not sitting the computing test. Therefore, it is recommended that you book to sit at an early time.

• Because online Maple TA tests are available for an extended period, medical certificates will generally not be accepted as excuses for not completing these tests. Therefore, it is recommended that you complete these tests as early as possible.

• 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 3090, Red Centre.

Change of enrolment

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

School of Mathematics and Statistics Policies

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.

Course improvement

You will be invited to complete electronically a CATEI Student Subject Survey at the end of the semester.

Aims

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

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

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.

Peter Brown
Director of First Year Studies
School of Mathematics and Statistics
fy.MathsStats@unsw.edu.au
ADDITIONAL INFORMATION FOR MATH1141 HIGHER MATHEMATICS 1A

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

Content

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

Assessment

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

The class tests and computing tests for MATH1141 are the same as those for MATH1131. However, the MATH1141 end of semester exam will contain questions that are quite different from those in the MATH1131 exam.
APPLICATIONS FOR SPECIAL CONSIDERATION IN
FIRST YEAR MATHEMATICS COURSES SEMESTER 1 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 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 ON-LINE.**

   Please refer to link below for How to Apply for Special Consideration,
   
   https://my.unsw.edu.au/student/atoz/SpecialConsideration.html#
   
   ApplyingforSpecialConsideration

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 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.

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 of grants of additional assessment will be available via the Mathematics website. Dates for this will be advised.

   b) **A final** list of results and of grants of additional assessment will be available via the Mathematics website. Dates for this will be advised.

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.

   The date for Summer session additional assessment examinations will be advised.

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

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.

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

Please note that the order of the syllabus changed in 2014, in accordance with requests from the Engineering Faculty and the School of Physics. It is important to note this in regard to the class tests from previous years.

The computer package Maple will be used in the algebra course. An introduction to Maple is included in the booklet *Computing Laboratories Information and First Year Maple Notes 2015*.

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

**Chapter 1. Introduction to Vectors**

**Lecture 1.** Vector quantities and $\mathbb{R}^n$. (Section 1.1, 1.2).

**Lecture 2.** $\mathbb{R}^2$ and analytic geometry. (Section 1.3).

**Lecture 3.** Points, line segments and lines. Parametric vector equations. Parallel lines. (Section 1.4).

**Lecture 4.** Planes. Linear combinations and the span of two vectors. Planes though the origin. Parametric vector equations for planes in $\mathbb{R}^n$. The linear equation form of a plane. (Section 1.5).

**Chapter 2. Vector Geometry**

**Lecture 5.** Length, angles and dot product in $\mathbb{R}^2$, $\mathbb{R}^3$, $\mathbb{R}^n$. (Sections 2.1, 2.2).

**Lecture 6.** Orthogonality and orthonormal basis, projection of one vector on another. Orthonormal basis vectors. Distance of a point to a line. (Section 2.3).

**Lecture 7.** Cross product: definition and arithmetic properties, geometric interpretation of cross product as perpendicular vector and area (Section 2.4).

**Lecture 8.** Scalar triple products, determinants and volumes (Section 2.5). Equations of planes in $\mathbb{R}^3$: the parametric vector form, linear equation (Cartesian) form and point-normal form of equations, the geometric interpretations of the forms and conversions from one form to another. Distance of a point to a plane in $\mathbb{R}^3$. (Section 2.6).

**Chapter 3. Complex Numbers**

**Lecture 9.** Development of number systems and closure. Definition of complex numbers and of complex number addition, subtraction and multiplication. (Sections 3.1, 3.2, start Section 3.3).

**Lecture 10.** Division, equality, real and imaginary parts, complex conjugates. (Finish 3.3, 3.4).

**Lecture 11.** Argand diagram, polar form, modulus, argument. (Sections 3.5, 3.6).

**Lecture 12.** De Moivre’s Theorem and Euler’s Formula. Arithmetic of polar forms. (Section 3.7, 3.7.1).

**Lecture 13.** Powers and roots of complex numbers. Binomial theorem and Pascal’s triangle. (Sections 3.7.2, 3.7.3, start Section 3.8).

**Lecture 14.** Trigonometry and geometry. (Finish 3.8, 3.9).

**Lecture 15.** Complex polynomials. Fundamental theorem of algebra, factorization theorem, factorization of complex polynomials of form $z^n - z_0$, real linear and quadratic factors of real polynomials. (Section 3.10).
Chapter 4. Linear Equations and Matrices

Lecture 16. Introduction to systems of linear equations. Solution of $2 \times 2$ and $2 \times 3$ systems and geometrical interpretations. (Section 4.1).

Lecture 17. Matrix notation. Elementary row operations. (Sections 4.2, 4.3).

Lecture 18. Solving systems of equations via Gaussian elimination. (Section 4.4)

Lecture 19. Deducing solubility from row-echelon form. Solving systems with indeterminate right hand side. (Section 4.5, 4.6).

Lecture 20. General properties of solutions to $Ax = b$. (Section 4.7). Applications. (Section 4.8) or Matrix operations (start Section 5.1)

Chapter 5. Matrices


Lecture 22. Inverses and definition of determinants. (Section 5.3 and start Section 5.4).

Lecture 23. Properties of determinants. (Section 5.4).

EXTRA ALGEBRA TOPICS FOR MATH1141

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

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

Vector Geometry. Use of vectors to prove geometric theorems, further applications of vectors to physics and engineering.

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

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

Matrices and Determinants. Rotations of Cartesian coordinate systems and orthogonal matrices, evaluation of special determinants and connections with areas.

ALGEBRA PROBLEM SETS

The Algebra problems are located at the end of each chapter of the Algebra Notes booklet. They are also available from the course module on the UNSW Moodle server. 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. Questions marked with a [V] have a video solution available from the course page for this subject on Moodle. The problems marked [X] are intended for students in MATH1141 – they relate to topics which are only covered in MATH1141. Extra problem sheets for MATH1141 may be issued in lectures.

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

Tutors may need to vary a little from this suggested problem schedule.

**MATH1131 WEEKLY SCHEDULE**

<table>
<thead>
<tr>
<th>For tutorial in week</th>
<th>Try to do up to</th>
<th>Homework Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>chapter</td>
<td>problem</td>
</tr>
<tr>
<td>1</td>
<td>No tutorial, but start learning how to use Maple and Maple TA</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>30</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>37</td>
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<tr>
<td>6</td>
<td>3</td>
<td>17 (Test 1)</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>59</td>
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<tr>
<td>9</td>
<td>3</td>
<td>82</td>
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<td>10</td>
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<tr>
<td>11</td>
<td>4</td>
<td>43</td>
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<tr>
<td></td>
<td>5</td>
<td>12</td>
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<tr>
<td>12</td>
<td>5</td>
<td>19 (Test 2)</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>53</td>
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23
<table>
<thead>
<tr>
<th>week</th>
<th>location</th>
<th>chapter</th>
<th>problem</th>
<th>online</th>
<th>recommended</th>
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<td>1, 5, 18</td>
<td>4, 6(a), 16(a), 21</td>
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<td>3</td>
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<td>1</td>
<td>50</td>
<td>41(d)</td>
<td>31(d), 33(b), 34(b), 41(b), 46</td>
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<tr>
<td>4</td>
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<td>2</td>
<td>16</td>
<td>3, 9(a)</td>
<td>1(b), 8, 9(b)</td>
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<td>17(b), 27(a)</td>
<td>14(b), 25(a), 29(a), 30(b)</td>
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<td>6</td>
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<tr>
<td>7</td>
<td>Classroom</td>
<td>3</td>
<td>36</td>
<td>22</td>
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<td>59</td>
<td>40</td>
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<td>9</td>
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<td>3</td>
<td>82</td>
<td>60(b), 74</td>
<td>61(b), 68(b), 72</td>
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<td>3</td>
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<tr>
<td>10</td>
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<td>34</td>
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<td>7, 15</td>
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<td>5</td>
<td>53</td>
<td>28, 38</td>
<td>20, 23, 26, 35, 39</td>
</tr>
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</table>
CLASS TESTS AND EXAMS

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

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

<table>
<thead>
<tr>
<th>Test</th>
<th>Week</th>
<th>Topics covered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>chapter</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
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<tr>
<td>2</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Please note that the order of the syllabus has changed in 2014. The SAMPLE TESTS contained in the Algebra Notes are based on this new syllabus, but please be aware that Sample Tests from previous years may not be relevant.

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

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

### 1. Sets, inequalities and functions. (2.5 hours)

- \( \mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R} \). Open and closed intervals. Inequalities.
- Functions: sums, products, quotients, composites.
- Polynomials, rational functions, trig functions as examples of continuous functions.
- Implicitly defined functions.

<table>
<thead>
<tr>
<th>SH10</th>
<th>SH9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2, 1.3</td>
<td>1.2, 1.3</td>
</tr>
<tr>
<td>1.6-1.7</td>
<td>1.6-1.7</td>
</tr>
</tbody>
</table>

### 2. Limits. (2 hours)

- Informal definition of limit as \( x \to a \) (a finite).
- Formal definition of limit as \( x \to \infty \).
- Limit rules. The pinching theorem.

<table>
<thead>
<tr>
<th>SH10</th>
<th>SH9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1, 2.2</td>
<td>2.1, 2.2</td>
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<tr>
<td>pp177-178</td>
<td>pp222-224</td>
</tr>
<tr>
<td>pp195-198</td>
<td>pp243-246</td>
</tr>
<tr>
<td>2.3, 2.5</td>
<td>2.3, 2.5</td>
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</tbody>
</table>

### 3. Properties of continuous functions. (1.5 hours)

- Combinations of continuous functions.
- Intermediate value and min-max theorems.
- Relative and absolute maxima and minima.

<table>
<thead>
<tr>
<th>SH10</th>
<th>SH9</th>
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<tbody>
<tr>
<td>2.4</td>
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<tr>
<td>2.6, B1, B2</td>
<td>2.6, B1, B2</td>
</tr>
<tr>
<td>4.3-4.5</td>
<td>4.3-4.5</td>
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</tbody>
</table>

### 4. Differentiable functions. (2 hours)

- Definition of derivative via tangents.
- Derivatives of polynomial, rational and trig functions.
- Implicit differentiation, fractional powers.

<table>
<thead>
<tr>
<th>SH10</th>
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<tbody>
<tr>
<td>3.1</td>
<td>3.1</td>
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<td>3.2-3.5</td>
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<td>3.5-3.6</td>
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<tr>
<td>3.7</td>
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</table>

### 5. The mean value theorem and applications. (2 hours)

- Mean value theorem and applications.
- L’Hôpital’s rule.

<table>
<thead>
<tr>
<th>SH10</th>
<th>SH9</th>
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<tbody>
<tr>
<td>4.1, 4.2</td>
<td>4.1, 4.2</td>
</tr>
<tr>
<td>11.5, 11.6</td>
<td>10.5, 10.6</td>
</tr>
</tbody>
</table>
6. **Inverse functions.** (1.5 hours)
Domain, range, inverse functions,
the inverse function theorem. 7.1, B3 7.1, B3
Inverse trig functions, their derivatives and graphs. 7.7 7.7

7. **Curve sketching.** (3 hours)
Use of domain, range, intercepts, asymptotes,
even or odd, calculus. 4.7, 4.8 4.7, 4.8
Parametrically defined curves.
Relation between polar and Cartesian coordinates. 10.2 9.3
Sketching curves in polar coordinates. 10.3 9.4

8. **Integration.** (5 hours)
Riemann sums, the definite integral and its
algebraic properties. 5.1, B5 5.1, B5
Indefinite integrals, primitives and the
two fundamental theorems of calculus. 5.2-5.5 5.2-5.5
Integration by substitution and by parts. 5.6, 8.2 5.6, 8.2
Integrals on unbounded domains, limit form of
comparison test. 11.7 10.7

9. **Logarithms and exponentials.** (2 hours)
In as primitive of 1/x, basic properties,
logarithmic differentiation. 7.2, 7.3 7.2, 7.3
Exponential function as inverse of ln, basic properties.
\(a^x\), logs to other bases. 7.4-7.6 7.4-7.6

10. **Hyperbolic functions** (1.5 hours)
Definitions, identities, derivatives, integrals
and graphs. 7.8 7.8
Inverse hyperbolic functions. 7.9 7.9
Integrals involving hyperbolic or trig substitution.

11. **Review.** (1 hour)
CALCULUS SYLLABUS FOR
MATH1141 HIGHER MATHEMATICS 1A

This is the syllabus for Higher Mathematics 1.
The Calculus textbook is S.L. Salas & E. Hille Calculus - One and Several Variables, any recent edition, Wiley. References to the 10th and 9th editions are shown as SH10 and SH9. For help with understanding the foundations of calculus you will find the following book readable and useful: Calculus by M. Spivak (there are multiple copies in the library). References to Spivak are in the column headed Sp.

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

1. Sets, inequalities and functions. (2 hours)  SH10   SH9   Sp
N, Z, Q, R. Open and closed intervals. Inequalities.  1.2, 1.3  1.2, 1.3  1, 2
Functions: sums, products, quotients, composites.  1.5-1.7  1.5-1.7
Polynomials, rational functions, trig functions, as examples of continuous functions. Implicitly defined functions.

2. Limits. (2.5 hours)  SH10   SH9   Sp
Formal definition of limits as x → a (a finite)  2.1, 2.2  2.1, 2.2  5
and as x → ∞  pp177-178 pp222-224
pp195-198 pp243-245
Limit rules. The pinching theorem.  2.3, 2.5  2.3, 2.5

3. Properties of continuous functions. (1.5 hours)  SH10   SH9   Sp
Combinations of continuous functions.  2.4  2.4
Intermediate value and min-max theorem.  2.6, B1, B2  2.6, B1, B2
Relative and absolute maxima and minima.  4.3-4.5  4.3-4.5

4. Differentiable functions. (1.5 hours)  SH10   SH9   Sp
Definition of derivatives via tangents.  3.1  3.5
Derivatives of sums, products, quotients and composites.  3.2-3.5  3.4, 3.7
Rates of change. Higher derivatives.  3.5, 3.6  3.6
Derivatives of polynomial, rational and trig functions.  3.7  3.7
Implicit differentiation, fractional powers.
5. **The mean value theorem and applications.** (2 hours)
   Rolle and mean value theorems (with proof).
   Applications of the mean value theorem.
   L’Hôpital’s rule.
   SH10  
   4.1, 4.2  
   11.5, 11.6  
   SH9  
   4.1, 4.2  
   10.5, 10.6  
   Sp  
   11

6. **Inverse functions.** (2 hours)
   Domain, range.
   Inverse functions, injective functions,
   the inverse function theorem.
   Inverse trig functions, their derivatives and graphs.
   SH10  
   7.1, B3  
   7.7  
   SH9  
   7.1, B3  
   7.7  
   Sp  
   12

7. **Curve sketching.** (3 hours)
   Odd and even functions, periodicity, calculus.
   Use of domain, range, intercepts, asymptotes, periodicity,
   symmetry and calculus.
   Parametrically defined curves.
   Relation between polar and Cartesian coordinates.
   Sketching curves in polar coordinates.
   SH10  
   4.7, 4.8  
   10.2  
   SH9  
   4.7, 4.8  
   9.3  
   Sp  
   12

8. **Integration.** (5 hours)
   Riemann sums, the definite integral and its
   algebraic properties.
   Indefinite integrals, primitives and the
   two fundamental theorems of calculus.
   Integration by substitution and by parts.
   Improper integrals, limit form of comparison test.
   SH10  
   5.1, B5  
   5.2-5.5  
   5.6, 8.2  
   11.7  
   SH9  
   5.1, B5  
   5.2-5.6  
   5.6, 8.2  
   10.7  
   Sp  
   13

9. **Logarithms and exponentials.** (2 hours)
   ln as primitive of 1/x, basic properties,
   logarithmic differentiation.
   Exponential function as the inverse of ln
   basic properties.
   a^x, logs to other bases.
   SH10  
   7.2, 7.3  
   7.4-7.6  
   SH9  
   7.2-7.6  
   Sp  
   14

10. **Hyperbolic functions** (1.5 hours)
    Definitions, identities, derivatives, integrals
    and graphs.
    Inverse hyperbolic functions.
    SH10  
    7.8  
    7.9  
    SH9  
    7.9  
    Sp  
    18

11. **Review.** (1 hour)
PROBLEM SETS

The Calculus problems are located at the end of each chapter of the Calculus Notes booklet. They are also available from the course module on the UNSW Moodle server. Some of the problems are very easy, some are less easy but still routine and some are quite hard. To help you decide which problems to try first, each problem is marked with an [R], 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 [V] have a video solution available on 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 MATH1141 – they relate to topics which are only covered in MATH1141. Extra problem sheets for MATH1141 may be issued in lectures.

Remember that working through a wide range of problems is the key to success in mathematics.

MATH1131 WEEKLY SCHEDULE

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

<table>
<thead>
<tr>
<th>Week</th>
<th>Calculus problems</th>
<th>Homework Problems</th>
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<tr>
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<td>Problems up to</td>
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<tr>
<td>5</td>
<td>4</td>
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</table>
**MATH1141 WEEKLY SCHEDULE**

<table>
<thead>
<tr>
<th>Tutorial</th>
<th>Try to do up to</th>
<th>Questions</th>
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</thead>
<tbody>
<tr>
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<td>Revision</td>
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<tr>
<td>2</td>
<td>Classroom</td>
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</tr>
<tr>
<td>3</td>
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<td>2</td>
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<td>4</td>
<td>Classroom</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Classroom</td>
<td>Calculus Class Test 1</td>
</tr>
<tr>
<td>6</td>
<td>Classroom</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Online</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Classroom</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Classroom</td>
<td>Calculus Class Test 2</td>
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<tr>
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<td>8</td>
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<tr>
<td>11</td>
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<td>8</td>
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<td>12</td>
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<td>9</td>
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<tr>
<td>13</td>
<td>Online</td>
<td>10</td>
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</tbody>
</table>

**CLASS TESTS AND EXAMS**

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

Test 1  Week 5.
Test 2  Week 9.

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

<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>1, 2 and 3</td>
<td>Chapters 1–3</td>
</tr>
<tr>
<td>2</td>
<td>4, 5 and 6</td>
<td>Chapters 4–6</td>
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</table>

It is important to note that:

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

The University of New South Wales has a policy that all its students should be introduced to the basics of computer use during their course. For students in Business, Biological and Physical Sciences and Engineering, part of that requirement is met by the Computing component of First Year Mathematics. Most of you will also need to use computers in other courses within your program.

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

Computing lab

The main computing laboratory is Room G012 of the Red Centre. You can get to this lab by entering the building through the main entrance to the School of Mathematics and Statistics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, on the mezzanine level of the Red Centre. 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 am to 9 pm</td>
</tr>
<tr>
<td>Week 10:</td>
<td>Monday and Friday</td>
<td>9 am to 9 pm</td>
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<td></td>
<td>Saturdays, Sundays</td>
<td>Closed</td>
</tr>
<tr>
<td>Outside Session Times</td>
<td>Monday to Friday</td>
<td>9 am to 9 pm</td>
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<tr>
<td></td>
<td>Closed</td>
<td>Closed</td>
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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

Two virtual Linux lab machines called sigma and sigma2 (sigma.maths.unsw.edu.au and sigma.maths.unsw.edu.au) are available for remote access from your own laptop or home computer. Sigma and sigma2 have exactly the same software available as one of the Red-Centre linux lab computers (e.g. Maple, MATLAB, etc.). To use this service you will need to download and install the NX client which is freely available for Windows, Mac and Linux. Information on how to download and install this software and use it to connect to sigma is available on
UNSW Moodle in the Computing Component folder of MATH1131/1141. Alternatively, if you know how, you can use ssh to access sigma.

Please note that because this is a remote service that can be used by many students, you may find that sigma is slow to respond or is unavailable, particularly at times of high demand. Hence you are advised not to rely on sigma at critical times such as close to test deadlines. Using an actual computer in the lab or software, such as Maple, installed on your own computer will usually be more reliable.

How to start

The MATH1131/1141 module in UNSW Moodle has several short instructional videos illustrating how to access and use all the computing related components of MATH1131/1141. The general introductory videos are located in the Course Materials folder, with videos related to Maple located in the Computing component folder and those related to Maple TA in the Online Assessment in Algebra, Calculus and Computing folder.

Following this you should use some of your free time in week 1 go to the Red Centre lab G012 and complete the Maple introductory module and in Maple TA you should complete the assignment “Using Maple TA”. Consultants will be on duty from 12noon to 4pm each day to help you get started with these tasks.

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, issued to you at enrolment. 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.

From week 1 onwards, you are expected to master Chapter 1 and sections 2.1 to 2.11 in the First Year Maple Notes 2015 by completing the self-contained Maple learning modules and by obtaining help, if necessary, from the Consultants who will be available in Room G012 from 12noon to 4pm each weekday of weeks 1 to 9.

Computing syllabus

The Maple computing component is taught via a series of self-paced modules located in UNSW Moodle. You are expected to work steadily through these modules, completing the quiz at the end of each module before moving on to the next module. The timetable for the completion of these small tests is explained in detail in the section on Computing tests on page 10 and is clearly visible in Maple TA.

The online teaching package consists of the following modules:

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

Module 1 The Basics: arithmetic operations, brackets, constants and variables.

Module 2 Functions: expressions vs functions, Maple’s functions, substituing in an expression, piecewise defined functions, simplifying an expression.

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

Module 4 Collections of Expressions: Maple sequences, sets and lists, sums and products, manipulating Maple structures.
Module 5 Complex Numbers and Equations: complex numbers, equations, exact and approximate solutions.

Module 6 Plotting: plotting functions of one variable, parametric plots, polar plots, implicit plots, data plots.

Module 7 Linear Algebra: creating and manipulating vectors and matrices, vector and matrix operations, Gaussian elimination.

Using other computers

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

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 10.

The second form of computing test will be run under exam conditions in the School’s computing laboratories during week 10. You must book for the test through the School’s Student Web Portal, accessible via the “Maths & Stats marks” link in the course menu of MATH1131/1141 on UNSW Moodle, and bring your UNSW Student ID card to the test. All tests are linked to the Algebra and Calculus material, so you should make sure you understand the course work before trying them.

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

Special consideration for the laboratory test

Because the computing tests can be sat at many different times, medical, or other, reasons for missing the test will generally not be accepted. For this reason you are advised to choose an early time to sit the test. If you consider that you have an exceptional reason for missing the test then you must speak to Dr Kress, Lecturer in Charge of First Year Computing as soon as possible after the tests have been completed.

Note that a medical or similar resit may be denied if there is insufficient evidence of preparation for the missed test.

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 4102)
Lecturer in Charge
First Year Computing
Details of the computer laboratory Maple test follow in the next pages.
MATH1131/1141 LABORATORY 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 through Moodle. This booking facility should be available during week 8 of semester. When you have logged on, follow the appropriate link to get instructions about how to make a booking. If you believe that all the proposed times will be impossible for you, inform the Student Services Office immediately.

The test will be on the features of Maple which are covered in Chapter 1 and sections 2.1 to 2.11 of the First Year Maple Notes 2015.

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 online copy of the Notes, the online help within Maple itself and the online self-paced lessons from Moodle. However, you WILL need to practise for the test by working through the practice problems provided on Maple TA.

For each of the practice problems, Maple TA will show you the correct answer, 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.**

A sample laboratory test will be made available in Maple TA by the start of week 6. Try to do it in 35 minutes AFTER you have worked through all the practice problems. More details on this laboratory test will be made available during the semester and posted on UNSW Moodle.

You will NOT be allowed to take any calculators or writing materials (pens, pencils, paper) into the test.
STUDENT-OWNED COMPUTERS FOR MATHEMATICS COURSES

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

All of our courses have a 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.

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>
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