THE UNIVERSITY OF SYDNEY
Semester 1, 2011

Information Sheet for **MATH1001 Differential Calculus**

Websites
It is important that you check both the MATH1001 website and the Junior Mathematics website regularly. Both sites may be accessed through WebCT, or directly.

Junior Mathematics webpage: `http://www.maths.usyd.edu.au/u/UG/JM/`

MATH1001 webpage: `http://www.maths.usyd.edu.au/u/UG/JM/MATH1001`

Important announcements relating to Junior Mathematics are posted on the Junior Mathematics page.
On the MATH1001 page you will find on-line resources and other useful links. Announcements regarding assessment tasks will be made on this page at various times throughout the semester. Make sure you check the page weekly.

Lectures
There are 3 different lecture streams. You should attend one stream (that is, two lectures per week), as shown on your personal timetable.

Times	Location	Lecturer
8 am Thu & 9 am Fri	E Ave Aud	Weeks 1–6: Dr N Saunders, Carslaw room 807 Weeks 7–13: Dr X Liu, Carslaw room 724
11 am Thu & Fri	E Ave Aud	A/Prof R Howlett, Carslaw room 709
11 am Thu & Fri	Wallace	Dr Z Zhang, Carslaw room 620

Lectures run for 13 weeks, and the last lecture will be on Friday 3 June.

Consultation times
Lecturers are available for consultation as follows:

Dr Saunders:	Thursdays (weeks 1–6), 1–2 pm, in Carslaw room 351.
Dr Liu:	Fridays (weeks 7–13), 1–2 pm, in Carslaw room 452.
Dr Zhang:	Mondays, 1–2 pm, in Carslaw room 620.
A/Prof Howlett:	Tuesdays, 1–2 pm, in Carslaw room 709.

Note: You may attend any of these consultations, irrespective of which lecture stream you attend.

Tutorials
Tutorials (one per week) start in week 2. You should attend the tutorial given on your personal timetable. Attendance at tutorials will be recorded. Your attendance cannot be recorded unless you attend the tutorial in which you are enrolled. Your attendance record will be taken into account in the event that you apply for special consideration at any stage.

Tutorial sheets
The tutorial question sheets for a given week will be available on the MATH1001 web page. **You must print out the current week's tutorial sheet from the web, and take it to your tutorial with you.**
Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n.

Assessment
Your final raw mark for this unit will be calculated as follows:

65%:	Exam at end of semester 1.
30%:	Quiz mark.
5%:	Assignment mark.

Your final raw mark is then scaled to produce your final mark. Marks are scaled so that the distribution of grades is consistent with the quality of the class, and the difficulty of the unit, as required by the University.

Examination
There is one examination of 1.5 hours' duration during the examination period at the end of semester 1. Further information about the exam will be made available at a later date.

Quizzes
Two quizzes will be held during tutorials, in the **weeks beginning 11 April and 23 May**. Each quiz is worth 15% of your final raw mark. You must sit for the quiz during the tutorial in which you are enrolled. Your quiz mark will not be recorded if you sit for the quiz in a tutorial in which you are not enrolled.

Assignments
One assignment will be marked, and will be worth 5% your final raw mark. The assignment will be due on **Thursday 31 March**. Please see page 25 of the Junior Mathematics Handbook for details relating to the submission of assignments.

Course notes
Course Notes for MATH1001 Differential Calculus. School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia.
Available from KOPYSTOP, 55 Mountain St Broadway.
See the Junior Mathematics Handbook for other references.

Where to go for help
For administrative matters, go to the **Student Office, Carslaw room 520.**
For help with mathematics, see your lecturer, or your tutor. Lecturers guarantee to be available during their indicated office hour, but may well be available at other times as well.
If you are having difficulties with mathematics due to insufficient background, you should go to the Mathematics Learning Centre (Carslaw room 455).

Objectives
The objectives of this unit are:

- to introduce the concept of a complex number;
- to consolidate your understanding of functions of one variable, limits and continuity;
- to illustrate the mathematical description of curves and surfaces in space;
- to introduce functions of two variables and partial derivatives;
- to introduce Taylor polynomials and Taylor series;
- to improve your ability to think logically, analytically, and abstractly;
- to enhance your problem-solving skills.

In addition, this unit provides students with a solid foundation for further studies in mathematics and/or other scientific disciplines.

Outcomes
Students who successfully complete this unit will be able to demonstrate competency in:

- applying mathematical logic and rigour to solving problems;
- reading and writing basic set notation;
- arithmetic operations with complex numbers in Cartesian, polar, and exponential form;
- using de Moivre's theorem to find powers and roots of complex numbers;
- solving simple polynomial equations involving complex numbers;
- interpreting geometrically certain algebraic expressions as curves and surfaces;
- calculating partial derivatives;
- finding equations of planes tangent to surfaces;
- finding critical points of functions of one and two variables;
- using the differential of a function in practical problems;
- calculating the directional derivative and the gradient vector for a function of two variables;
- interpreting the directional derivative and the gradient vector geometrically;
- applying an intuitive understanding of a limit and knowledge of basic limit laws to calculate the limits of functions;
- using L'Hôpital's rule;
- finding inverse functions;
- finding Taylor polynomials and the Taylor series expansion of a function;
- expressing mathematical ideas and arguments coherently in written form.

Proposed week-by-week outline

Week	Topics
1	Set notation, the real number line. Complex numbers in cartesian form. Complex plane, modulus.
2	Complex numbers in polar form. De Moivre's Theorem. Complex powers and nth roots.
3	Definition of $e^{i\theta}$ and e^z for z complex. Applications to trigonometry. Revision of domain and range of a function.
4	Working in $\mathbb{R}^3$. Curves and surfaces. Functions of 2 variables. Level curves.
5	Partial derivatives and tangent planes. The derivative as a difference quotient. Geometric significance of the derivative. Discussion of limit.
6	Higher order partial derivatives. Limits of $f(x, y)$. Continuity.
7	Maxima and minima of $f(x, y)$.
8	The chain rule. Implicit differentiation.
9	Directional derivatives and the gradient.
10	Limit laws, l'Hôpital's rule, composition law. Definition of sinh and cosh and their inverses.
11	Taylor polynomials. The remainder term.
12	Taylor series.
13	Revision.