

THE UNIVERSITY OF SYDNEY
Semester 1, 2009

Information Sheet for **MATH1902 Linear Algebra (Advanced)**

Web Site

It is important that you check the Junior Mathematics web site regularly.

It may be found by following links from the University of Sydney front page, or from WebCT, or by going directly to

<http://www.maths.usyd.edu.au/u/UG/JM/>

Important announcements relating to Junior Mathematics are posted on the site, and there is a link to the MATH1902 page. On the MATH1902 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

| Times | Location | Lecturer | Consultation |
|--------------------|---------------|---|-----------------|
| 11 am Mon & Tue | Chemistry LT1 | Weeks 1–6 Dr J East, Carlaw room 635 | Tuesdays, 1-2pm |
| | | Weeks 7–13 A/Prof A Molev, Carlaw room 707 | Mondays, 12-1pm |

Lectures run for 13 weeks, and the last lecture will be on Tuesday 2 June.

Tutorials

Tutorials (one per week) start in week 1. 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 sheets are printed in the back of the course notes. **You should take your book of notes to your tutorial, since you will need to have the current week's sheet with you at your tutorial.** The tutorial sheets are also available on the MATH1902 web page.

Solutions to tutorial exercises for a given week will usually be posted on the web by Friday of that week.

Assessment

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

- 70%: Exam at end of semester 1.
- 20%: Quiz mark.
- 10%: 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, on **Wednesday 1 April** and **Wednesday 6 May**. Each quiz is worth 10% 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

Two assignments will be set and marked. Each assignment is worth 5% of your final raw mark. Assignments will be due on **Tuesday 7 April** and **Tuesday 2 June**. Please see page 26 of the Junior Mathematics Handbook for details relating to the submission of assignments.

Course notes

CJ Durrant. *Lecture Notes for MATH1002/1902: Vectors*. School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia, 2009.

J Henderson and R Howlett et al. *Lecture Notes for MATH1002/1902: Linear Algebra*. School of Mathematics and Statistics, University of Sydney, Sydney, NSW, Australia, 2009. Both books are available from *KOPYSTOP*. 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.

Week-by-week outline

| Week | Lecture | Topics |
|-----------|---------|--|
| 1 | 1 | Scalars and vectors. Position vectors. Division of a line segment in a given ratio. |
| | 2 | The algebra and geometry of vectors. Cartesian and polar coordinates in two dimensions |
| 2 | 3 | Cartesian coordinates in three dimensions. Direction cosines. |
| | 4 | Linear independence. The scalar product. Angles. |
| 3 | 5 | Algebraic properties of the scalar product. Projection. |
| | 6 | The vector product. Algebraic properties of the vector product. |
| 4 | 7 | Trigonometry. The scalar triple product. Shortest distance from a point to a line. |
| | 8 | Equations of lines. Vector product form of the equations. |
| 5 | 9 | Equations of planes. Shortest distance from a point to a plane. Normals. |
| | 10 | Finding the intersection of a collection of planes and lines. Simultaneous linear equations |
| 6 | 11 | Row operations. Row echelon form of a matrix. Back substitution. |
| | 12 | Matrix notation, row and column vectors. Matrix algebra. |
| 7 | 13 | Using sigma notation to prove results about sums and products of matrices |
| | 14 | The identity matrix. Algebraic properties of the inverse of a matrix |
| 8 | 15 | Using row operations to find the inverse of a matrix. Elementary matrices. |
| | 16 | Proofs of properties of matrices. Eg, if A and B are square matrices then, $AB = I$ implies $BA = I$. |
| 9 | 17 | The rank of a matrix. Permutations. |
| | 18 | The parity of a permutation. The product of permutations. |
| 10 | 19 | Determinants, minors and cofactors. The adjoint matrix. |
| | 20 | Connection between the adjoint matrix and row and column expansions. Fundamental properties of determinants |
| 11 | 21 | Determinants and linear equations. |
| | 22 | Determinants of elementary matrices. The product formula for determinants. |
| 12 | 23 | Eigenvalues and eigenvectors. The characteristic equation. |
| | 24 | Linear combinations of vectors. Linear independence. Diagonalizing a matrix. |
| 13 | 25 | Eigenvalues and determinants. Using eigenvalues to compute large powers of a matrix. |
| | 26 | Linear transformations of the plane. Rotations and reflections. |