University of Ottawa
Department of Mathematics and Statistics
MAT 1341D: Introduction to Linear Algebra Winter 2009

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• Regular Office hours: TUE 10:05-12:05, they will take place in my office (KED, room B07-B). If it is not possible to see me during my regular office hours, please talk to me after class or send me an email to set up an appointment. Special office hours before the tests will be announced later.
• Prerequisites: MAT 1339 or MAT1340 or Ontario 4U Calculus and Vectors (MCV4U), or an equivalent. You must have one of these to take the course.
• Lectures: Tuesday, 19:00 - 20:30 MCD 146 and Thursday, 19:00 - 20:30 MCD 146.
• Study break: February 15-21, 2009. There will be no lectures or DGD during the study break.

DGD = Problem sessions: DGD 1, Thursday, 20:30 - 22:00 MCD 146;

The DGD is a part of the course and participation is mandatory. The TA will present solutions to problems from the textbook, similar to the assigned homework problems and the problems on the tests. Because of space reasons, you must go to the DGD for which you are registered.
• Textbook: "Elementary Linear Algebra", 2nd edition, by W. Keith Nicholson (McGraw-Hill Ryerson). All assigned exercises are taken from the textbook and have solutions in the back of the book.
• Course outline: We will cover the topics stated in the official course description (see the calendar or the course web page). In the textbook, these are approximately the following sections: 1.1–1.5, 2.1–2.5, 2.8, 3.1–3.3, 3.5, 4.1–4.6, 4.9, 5.1–5.2. We will cover the material in the following order (approximatively):

Lectures 1-3 (Jan. 6 – Jan. 13): Part of 2.5 and 3.1–3.3, 3.5 (Review of complex numbers and vector geometry).
Lectures 4-8 (Jan. 15 – Jan. 29): 1.1–1.5.
Lectures 9-10 (Feb. 3 – Feb. 5): 2.1, 2.2.
Lectures 11-15 (Feb. 10 – March 3): 4.1 – 4.4.
Lectures 16-20 (March 10 – March 19): 5.1 – 5.3, 4.9
Lectures 21-23 (March 24 – March 31): 2.3 – 2.5, 2.8
Lectures 24-25 (April 2 – April 7): 4.5, 4.6
Lectures 26 (April 9): Review
I may not cover all the material of a section as it is given in the book. You will of course only be responsible for the material covered in class.
• Homework assignments: There will be 4 homework assignments, due on the following Thursdays,

$$\textit{January}\ 29,\quad \textit{February}\ 26,\quad \textit{March}\ 12,\quad \textit{April}\ 2.$$

The homework will be announced 1 week before the due date. The homework has to

be handed before the beginning of the class – late homework will not be accepted. You must use the two cover sheet provided on the assignment.

Tests during the term: There will be three tests, all written in MNT 203 and scheduled as follows: Diagnostic Test: Saturday, January 17, 13:00–14:30;

Test 1: Saturday, February 7, 13:00–14:30;

Test 2: Saturday, March 21, 13:00–14:30.

The diagnostic test will cover the prerequisites of the course complex numbers and vector geometry. These will be reviewed during the first week of the course.

• Tests 1 and 2 as well as the final exam will be a mixture of multiple choice questions, short answer questions (no partial marks) and long answer questions.

• Missed tests cannot be written at another time. The weight of a missed tests will be added to the weight of the final exam in the calculation of the course mark.

All tests and the final exam are closed-book exams. Calculators are not allowed. You may not enter a test after, or leave before, the last 20 minutes have elapsed. You must present your student card during the test.

The marked test will be given back about one week later in the problem session. Unclaimed tests will be kept by the TA and can be claimed later during the term. All unclaimed assignments and tests will be shredded 6 months after the end of term. The marks from the tests and homework will be entered into Grade-book in Virtual Campus.

Final Grade: If your score on the final exam is less than 50%, your final grade = grade of the final exam, i.e., F if the grade of the final exam is less than 40%, E if the grade of the final exam lies between 40% and 50%. If the grade of the final exam is above 50%, the final grade will be the weighted average calculated as follows:

$$\mathbf{5\%diagnostic\quad test}, \mathbf{10\%homework}, \mathbf{35\%in-term\quad tests}, \mathbf{50\%final\quad exam}.$$

Each of the two tests will contribute 17.5%. In the formula above, your score on any one of the items diagnostic test, homework, and in-term tests will be replaced by your final exam grade if this is to your advantage.

Example: Say on the final exam you have at least 50% and this is better than your score on the diagnostic test and on test 2, but not as good as your result of the homework and on test 1. Then your final mark will be calculated as follows: 10% homework + 17.5% test 1 + 72.5% final exam.

Resources: Here's a short list of resources you can make use of this term to succeed in MAT 1341:

• My office hours (see above) and the DGD.

• The Mathematics Help Centre offers help on a one-to-one basis. It is located in Marion Hall, room 021, and open Monday to Thursday 10:00-19:00 and Friday, 10-15, starting in the second week of the term. You do not need an appointment; however the service is on a first-come-first-served basis. Don't wait until the last minute before a test to come for help! Make some hours available in your schedule to come regularly to ask questions!

• The Linear Algebra test bank is a collection of multiple choice questions. It can be accessed by every student registered in this course via the Centre for Mediated

Teaching and Learning. Applications of linear algebra: If you want to know more about the applications of linear algebra, visit the web site "Linear Algebra close to Earth" at

$$http://aix1.uottawa.ca/jkhoury/linearmain.htm$$

• Diagnostic test on Saturday, January 17, 13:00-14:30

The diagnostic test only covers material that is part of the prerequisites of this course. The following is a list of the relevant material for the test:

- find the equations of a line in 3-space, given sufficient data,

- find the equation of a plane in 3-space, given sufficient data,

- determine the intersection of 2 planes in 3-space,

- determine the intersection of 2 lines in 3-space,

- determine the intersection of a line and a plane in 3-space,

- use the cross product to compute (i) a normal to a plane and (ii) the area of a triangle in 2 or 3-space,

- use the dot product to compute (i) the angle between 2 vectors in 2 or 3-space, (ii) the length of a vector in 2 or 3-space, (iii) the projection of one vector on another, (iv) the distance from a point to a plane in 3-space, and (v) the distance from a point to a line in 2 or 3-space,

- add, subtract, multiply and divide complex numbers, and find the complex conjugate of a complex number, solve quadratic equations, with possibly complex solutions, calculate the absolute value.

To practice, I strongly recommend to do the exercises below.

2.5: 1bdfhj, 2b, 3bd, 4, 6b, 7bdf, 8bdf, 9bd. For the diagnostic test you are responsible for the subsections 2.5.1 and 2.5.2. Some of the remaining parts of subsection 2.5 will be done later in class.

3.1: 2b, 3b, 4b, 6b, 7b, 8b, 10bd, 13b, 14b, 15b, 17bdfhj.

3.2: 1bf, 2b, 3bdfh, 4bf, 8bf, 9b, 10b, 12, 16bdf, 22b, 24b.

3.3: 2bdfhjl, 4b, 6, 8b, 10bdf, 12bd, 13bdfhj, 14b, 16b, 19b, 20b, 21b, 22, 23b, 25bdfh.

3.5: 1b, 3b, 4bd, 10, 12; and from the Linear Algebra Testbank:

Vector Geometry: all, except 41, 43, 46, 50, 52, 56, 58, 72-74, 96-100, 123, 132-134, 139-150.

Complex Numbers: 4-12, 21-24, 26-28, 39-44.
The test will be completely multiple choice.

• Suggested exercises for MAT 1341 Winter 2009. Below is the list of suggested exercises. It is strongly recommended that you do all of them. The questions on the tests and the final exam will be similar to the suggested exercises.

1.1: 4b, 6bd, 7b, 8b, 9b, 10b, 11b.

1.2: 1b, 3b, 4dfh, 6dfh, 8, 9bd, 14bdfhj.

1.3: 1bf, 4bd, 6, 7bdf, 8.

1.4: 1bdf, 2bdfg, 4, 7b, 8b, 10bdfhjl, 13b, 14, 16.

1.5: 2bdfh, 4, 5df, 8, 9b, 13bdfhj, 14, 16b, 19b, 22, 24.

2.1: 1d, 3fhjl, 6b, 8bdf, 10bdf, 12b, 13b, 16, 18b, 19, 20.

2.2: 4bdf, 6b, 8b (correct answer: the (22)-entry is -2), 10bdfh, 12b.

2.3: 2bdf, 4, 6b, 7bdfh, 8, 12b, 16b.

2.4: 2bdfhj, 4.

2.5: 1bdfhj, 2b, 3bd, 4, 6b, 7bdf, 8bdf, 9bd, 10b, 11bd, 12bd, 14, 16.

2.8: 1bd.

3.1: 2b, 3b, 4b, 6b, 7b, 8b, 10bd, 13b, 14b, 15b, 17bdfhj.

3.2: 1bf, 2b, 3bdfh, 4bf, 8bf, 9b, 10b, 12, 16bdf, 22b, 24b.

3.3: 2bdfhjl, 4b, 6, 8b, 10bdf, 12bd, 13bdfhj, 14b, 16b, 19b, 20b, 21b, 22, 23b, 25bdfh.

3.5: 1b, 3b, 4bd, 10, 12.

4.1: 2bd, 3bd, 4bd, 5bdf, 6bd, 7b, 8b*df, 10, 14, 15b, 16b, 18, 20, 22, 24b. (8b*: the answer for 8b in the back of the book is not correct: if $r = 1$ then X is in U).

4.2: 1bd, 2bdf, 3b, 4bd, 5b, 7bdfh, 9bd, 14.

4.3: 1bd, 2bd, 3bd, 4bd, 6b, 7bd, 8b, 9bd, 10bdf, 16b, 20, 24.

4.4: 1b, 3b, 4b, 5b, 6b, 7bdf, 8, 10, 12, 16b. 4.5: 1bd (correct answer: 3), 2b, 3b, 5b, 6b, 7bd, 9bdfh, 10, 16.

4.6: 1b, 2b, 3b, 9bdf, 10, 12, 14b. 4.9: 1bdf, 2, 4, 6b, 10, 14b, 18b, 20. (Correction to Exercise 13b: The map S goes from $\mathbb{R}^m$ to $\mathbb{R}^n$, and the assumption is that T composed with S is the identity on ^{m}, and not on ^{n} as stated in the book.

5.1: 1bdf, 2bd, 3bd, 6bdf, 7bdf, 8bdf, 9bdf, 10b, 12b, 18, 20b, 24b, 26, 28.

5.2: 1bdfhjl, 2bdfh, 3bdfhjl, 4b, 5b, 10, 12b, 18, 20b, 22, 24bd.

5.3: 1bdfhjl, 2bdfh, 3bdfh, 4b, 5b, 6, 10b, 12, 14b, 16, 22.

• Suggested Exercises from the Linear Algebra Testbank

Vector Geometry all, except 41, 43, 46, 50, 52, 56, 58, 72-74, 96-100, 123, 132-134, 139-150.

Matrix Algebra: all 55 problems (for problem 8 note that, by definition, two matrices A and B commute if $AB = BA$.)

Systems of Linear Equations: all 87.

Determinants: all, except 16, 17, 55 and 88.

Complex Numbers: 4-12, 21-24, 26-28, 39-44.

Diagonalization: all, except 13. (Two matrices A and B are similar if $B = P^{-1}AP$ for some invertible matrix P.)

Linear Transformations: 1-11.

Inner Product: 1-9, 12-14, 16, 17.

Vector spaces: all, except 38 and 55-61.