INTRODUCTION TO LINEAR ALGEBRA

MAT 1341 3X Spring/Summer 2007

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Prerequisite: Ontario grade 12U Geometry and Discrete mathematics or OAC Algebra and Geometry or MAT 1340. You must have one of these to be enrolled.

Course Webpage: `http://www.maestro.uottawa.ca/` - sign in with your Infoweb account.

Office Hours(tentative): Monday: 16:00-16:55 and Wednesday: 17:00-17:55.

Lectures: Mondays 17:00-19:00, Wednesdays 18:00-20:00, in SCS E217. There are no lectures or DGD during the study break (July 11 - July 15). In addition, there will be no lectures or DGD on Monday, May 21 (Victoria Day) or Monday, July 2 (Canada Day).

DGD (Problem Sessions): Monday after class, 19:00-20:30. If there is no test scheduled, the TA will present solutions to problems similar to the assigned homework problems and problems on the tests.

Textbook:"Elementary Linear Algebra", 2nd edition, by W. Keith Nicholson. (McGraw-Hill Ryerson): 2.5.1, 2.5.2, 2.5.4, 3.1-3.3, 3.5, 4.1.2, 5.1, 5.2, (examples from 1.1, 4.1, 4.2.1, 4.2.3, 4.3.1, 4.3.2), 1.2-1.3, 1.4.1-1.4.4, 1.5, 4.2.2, 4.4, 4.5.1, 4.5.2, 4.5.3, 4.6.1-4.6.3, 2.1, 2.2.1, 2.3.1-2.3.3, 5.3, 4.9.1, 4.9.3. *Please note that the material in sections 2.5.1, 2.5.2, 2.5.4, and 3.1-3.3, 3.5 is merely review and will be the subject of the Diagnostic test.* The order in which the material is covered is roughly that of the above list, however, your class notes should be your primary source.

This course is not structured into modules: each test will examine all the material covered from the beginning of the course, up to that date. Thus, as the course progresses, tests will look more and more like the final exam, which will cover all the material in the course. No calculators will be needed or permitted on any test.

Evaluation: There will be a diagnostic test, two assignments, two tests and a final. Note that each test will examine all the material covered from the beginning of the course up to that date.

Test and Assignment schedule:

Diagnostic test	May 14	19:00-20:30	SCS E217
Assignment 1	May 23	18:00	SCS E217
Test 1	Jun 04	19:00-20:30	SCS E217
Assignment 2	Jun 27	18:00	SCS E217
Test 2	Jul 04	18:00-20:00	SCS E217
Final Exam	Jul 16	19:00-22:00	MNT 203

Test 1 will be held in the DGD on June 4. Test 2 will be held in class on July 4. The DGD on Monday July 9 may be converted to a Lecture, depending on time restraints.

Drop-In Centre: Help is also available in MRN 021 on Monday-Thursday 10:00am-3:00pm and on the following Fridays - July 6, July 13.

Suggested Exercises: See the last page of the outline to get started. In this course, the ability to understand and solve all of these problems will go a long way to bringing you success.

Calculation of Final Grade: If your score on the final exam is less than 50% your final grade is your score on the final exam. Otherwise: Your final grade for the course shall be the weighted average of your scores on the diagnostic test (5%), assignments (15% = 2 x 7.5%), tests (30% = 2 x 15%) and the final (50%). However, if your final is better than any test or assignment, the weight of that test will be shifted to the final. For example, suppose your mark on the final is better than that on assignment 1 and on test 2. In this case, your final grade will be the weighted average: diagnostic test (5%) + test 1 (15%) + assignment 2 (7.5%) + final (72.5%). (Your final grade calculation uses matrix multiplication.)

Diagnostic Test: This covers some material from high school (mainly from Geometry and Discrete Mathematics (MGA4U) or OAC Algebra and Geometry, plus some material on complex numbers from grade 11. Please see below for more details.

Missed assignments or tests cannot be written at another time. The weight of any piece of work that you miss will be added to that of the final in the calculation of the course mark.

Dont write any exam, especially the final, if you are unwell. This cannot be taken into account after the fact. Please consult the relevant faculty rules (academic regulations section 3.2.)

THE DIAGNOSTIC TEST

This test will consist of 12 multiple choice questions on material taken from high school vector geometry and complex numbers, plus some material presented in the first two classes. To practice, you should do the suggested "Vector Geometry and Complex Number Review" exercises below. In particular, you will need to know how to

1. find the equation of a line in 3-space, given sufficient data,
2. find the equation of a plane in 3-space, given sufficient data,
3. determine the intersection of 2 planes in 3-space,
4. determine the intersection of 2 lines in 3-space,
5. determine the intersection of a line and a plane in 3-space,
6. use the cross product to compute
   (a) a normal to a plane,
   (b) the area of a triangle in 2 or 3-space,
7. use the dot product to compute
   (a) the angle between 2 vectors in 2 or 3-space,
   (b) the length of a vector in 2 or 3-space,
   (c) the projection of one vector on another,
   (d) the distance from a point to a plane in 3-space,
   (e) the distance from a point to a line in 2 or 3-space,
8. add, subtract, multiply and divide complex numbers,
9. convert between the Cartesian and polar forms fof complex numbers.

Vector Geometry and Complex Number Review Problems:

Section 2.5	1bfj, 2b, 6b, 7bdf, 8bd, 17, 18, 19, 20bd, 21bd, 25b
Section 3.1	4a, 6b, 7b, 9b, 10bd, 11, 12b, 13b, 15b, 17dfj, 21
Section 3.2	4bd, 5, 6b, 8bdf, 9df, 10d, 14, 15, 16bdf, 18, 22, 24
Section 3.3	2dfhjl, 3, 4b,7bd,8b, 9, 10bdf, 11, 13bfj, 14b, 16b, 23b, 25
Section 3.5	1b, 3b, 4bd, 5, 8, 9, 10, 20b, plus: show that If u, v, and w are vectors in $\mathbb{R}^3$, then $u \times (v \times w) = (u \cdot w)v - (u \cdot v)w$, where $\times$ denotes the cross product and $\cdot$ the dot product.

SUGGESTED EXERCISES

The suggested excercises include those on the previous page covering vector geometry and complex numbers, as well as those below. Doing and understanding all of these problems will almost guarantee success in this course. Ignore them at your peril.

The problems are listed in the order that the relevant material is covered, not necessarily in the order it appears in the text.

The "[·]" around a problem indicates a problem that you will eventually be able to solve after more material is covered. Ignore them at first; they will appear later in the list of problems.

Section 5.1	1bdfh, 3bdfh, 4, 5, 7b, 8bdf, 9bdf, 13-17, 21-23, 30
Section 4.1	5bdf, 6bd, [7bd], 8, 9, 10, 13, 17, [18]
Section 5.2	1bdfh, 2bfh, 3ikl, 5, 6ab, [9], 11, 14, 17, [19], 21, 24b[d], 25, [27], 28-30, 35ab
Section 4.2	1abc, 2bd, [4bd], [5bd], 7bdfh, 8, 9b[d], 12-16
Section 4.3	1bd, 2b[d], [3bd], 4, [6bd], 7bd, [8b] , [9bd], 10
Section 1.1	4b, 5, 6, 7, 8b, 10
Section 1.2	1b
Section 1.3	7abc
Section 1.2	3b, 4bdfh, [6bdf], 7, 8, 9bd, 12-14a-g[h-j]
Section 1.3	1bdf, 4, 6, 7, 8
Section 1.4	1bdef, 2dh, 6, 7b, 9, 10, 12, 13b, 15, 16, 18, 20, 24b, 29, 31
Section 1.5	2bdf, 5bdf, 8, 9b, 10, 13, 15, 16b, 18c, 20, 21, 24, 26, 27, 31
Various Sections	4.1:7bd, 18; 5.2: 9,19, 24bd, 27; 4.2: 4bd, 5bd, 9bd; 4.3: 2bd, 3bd, 6bd, 8b, 9bd
Section 4.4	1bd, 3b, 4b, 5b, 6b, 7-13, 14*, 15b, 16(done in class)
Section 4.5	1bd, 2b, 3b, 6b, 7bd, 9, 11b, 16, 19, 20
Section 4.6	3 bd, 4b, d (If $Ax = b$, first find the projection b' of b onto col(A), then solve $Ax = b'$), 9a, 10
Section 2.1	1bd, 3h, 8, 10bdf, 13bd, 14-16, 20
Section 2.2	4bd, 5, 6, 10acdeg, 13, 14b, 19
Section 2.3	2bdf, 4, 5, 6b, 7, 8, 9, 11, 12, 15-17, 21*(more difficult)
Section 4.9	2bd, 3, 4, 5, 12a, 13a, 14b
Section 5.3	(In 1, 2 and 12, take $V = \mathbb{R}^n$ and $W = \mathbb{R}^m$) 1bdf, 2d, 3a,d, 12