MATH 223: LINEAR ALGEBRA September 2021 Richard Anstee

SCHEDULE: Section 101, 10-10:50 MWF in MATH ANNEX 1100. The room has sufficient ventilation is possible. It has windows but apparently windows are not as effective as the system in MATX 1100. We will use Canvas to support the course, in particular online submission of homework and the recording of grades. The bulk of the course will be posted on the website (not Canvas), available to those not even in the course.

INSTRUCTOR: Richard Anstee Office: Math Annex 1114, cell 778-323-6105
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OFFICE HOURS: After class 11-12 and also Tuesdays 5-6 for assignments due Wednesday or Thursdays 5-6 for assignments due Friday.

WEBSITE: https://personal.math.ubc.ca/∼anstee/math223/math223.html

TEXT: None required. *Linear Algebra and its Applications*, David C. Lay. is excellent for explanations; problems in general too elementary. The assignments will be independent of any given text. There is another text by Friedberg, Insel and Spence called Linear Algebra, Prentice-Hall (4th Edition) often used for MATH 223 that has a more theoretical focus and might make good supplementary reading. I provide extensive course notes.

OUTLINE: This course is aimed at excellent students who can go through the material at a faster pace than in MATH 152 or MATH 221. I usually attempt to cover all the material in both courses (i.e. including vector spaces/dimension from MATH 221 and Complex numbers from MATH 152) with lots of additional material added. I give greater emphasis to theoretical content. I will give some applications of linear algebra to Combinatorics in order to indicate the unexpected ways in which linear algebra can be applied. I'll also study VanderMonde determinants as used in partial fractions. A number of results will be considered in greater abstraction. I will be posting typed course notes (a poorly written text book) but not a direct record of the lectures. Please attend. I will attempt to keep the grading standards 'comparable' to those in MATH 221 though this may involve some judicious scaling of final grades. The following is a list of topics that will certainly be covered although not exactly in the order given with the section numbers from the Lay book

Linear and Matrix Algebra in 2×2 case	various Chapters. Notes provided online.
Gaussian Elimination and some of its uses	Ch.1 (1.1, 1.2, 1.3, 1.4, 1.5, 2.2)
Determinants	Ch.3 (3.1, 3.2, 3.3)
Vector Spaces in $\mathbf{R}^n$ (also lines, planes)	Ch.4 (1.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7)
Eigenvalues and Eigenvectors	Ch.5 (5.1, 5.2, 5.3, 5.5)
Linear Transformations and matrices	1.9, 3.3, 5.4
Orthogonality and Least Squares	Ch.6 (6.1, 6.2, 6.3, 6.4, 6.5)
(Orthogonal) Diagonalization of Symmetric Matrices	Ch.7 (7.1, 7.2)

GRADING SCHEME: 50% final, 30% midterms, 20% assignments.

ASSIGNMENTS: There will be about 10 assignments. Students may work together on assignments but must write up their work independently. Copying is forbidden. Any 2 (or more) assignments with some virtually identical answers deemed the result of copying will be given 0 total credit. The students are reminded of the plagiarism policies of the University.

MIDTERMS: Two 50 minute midterms scheduled for Friday Oct. 8 and Wednesday Nov. 17.

FINAL: 3 hours

PLAGIARISM: The students are reminded of the plagiarism policies of UBC (see Academic

Misconduct). You will need to cite sources. For this course: short passages from cited sources are allowed (should be indicated using quotation marks). Longer passages must be digested by you in some way and put into your own words (and still cited). Don't copy examples, create your own. Don't copy motivations, write your own. etc. I'm not interested in you submitting a mostly copied version of someone else's work for assignments. Ask me if you are confused whether something is plagiarism.

MISSED WORK: From time to time students may be unable to finish assignments or deliver talks. Examples of valid reasons include illness and travel to play a scheduled game for a varsity team. Examples of reasons that are not valid include conflicts with personal travel schedules or conflicts with work schedules. Any student who misses work is to present to their instructor the Department of Mathematics self-declaration form for reporting a missed assessment within 72 hours of the due date. This policy conforms with the UBC Vancouver Senate's Academic Concession Policy V-135 and students are advised to read this policy carefully. There is a new procedure allowing a self declaration concerning term work. It is available once per course. Apart from that exceptional situation do the following: please contact me before class time on the due date, and given your reasons for the missed work. Assuming the reasons are legitimate, I will note that you will be missing the assignment. In cases where the missed work has been allowed (by me or by a self declaration), your grade is computed out of a smaller number than 100 and then scaled appropriately to get a grade out of 100. For example, if an assignment counts 5% and a student informs me in advance of legitimate reasons for missing the midterm, the student would have a grade computed out of 95 and then this would be scaled to a grade out of 100 by multiplying by 100/95. Without advance notice (to me by email or phone message to Math Office etc) the default will be a grade of 0 in the missed work. A student must finish a significant amount of term work in order to pass the course. Three missed assignments will be the limit in this course.