

Matrix Algebra

Description: Matrix algebra is a subfield of linear algebra, with a focus on the \mathbb{R}^n setting. It is concerned with linear maps between linear subspaces of \mathbb{R}^n . We will consider systems of linear equations, operations on matrices, determinants, eigenvalues and eigenvectors, diagonalization of symmetric matrices, orthogonality and least squares. Along the way we will also touch on various applications.

Prerequisite: Either Calculus II, or a score of 64% or higher in Calculus I.

Textbook: *Linear Algebra and its Applications, Third Custom Edition for UBC*, by David C. Lay. Please note it is *not* the third edition of the book. Any edition of *Lay* will be ok, as long as you are willing to deal with the fact that the section numbers and problems vary from one edition to the next.

Grading:

- Three homework sets (10%) due May 24, June 7 and Monday June 19;
- Two 50-minute midterm exams (20% each) on Wednesdays May 31 and June 14;
- One 150-minute final exam (50%).

Policies:

1. Calculators and notes are not allowed in the exams.
2. Homework assignments are to be handed in at the beginning of classes. Late homework will be accepted but a 25% discount will be applied for each day late, using 3pm as the cut-off time. Solutions will be posted on web. A selection of the problems will be graded.
3. Permission to shift the weight of your missed midterms to other exams, or to ignore missed assignments, may be granted only in the following circumstances: (a) prior notice of a valid, documented absence (e.g. out-of-town varsity athletic commitment with a letter from a coach) on the scheduled date; or (b) notification to the instructor of absence due to a medical condition with a doctor's note. Otherwise, a score of 0 will be given for the missed midterms/assignments.
4. The period for final exams is June 26 to 30, 2017 inclusive. The exact time will be announced by the University in the middle of the term. Students should not make early travel plans that overlap with the scheduled exam period.

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homepage: <http://www.math.ubc.ca/~ttsai/courses/221-17Q2/>

List of sections:

- §1.1 Systems of linear equations
- §1.2 Row reduction and echelon forms
- §1.3 Vector equations
- §1.4 The matrix equation $Ax = b$
- §1.5 Solution sets of linear equations
- §1.6 Applications of linear systems (skip chemical equations)
- §1.7 Linear independence
- §1.8 Introduction to linear transformations
- §1.9 The matrix of a linear transformation
- §2.1 Matrix operations
- §2.2 The inverse of a matrix (skip elementary matrices)
- §2.3 Characterizations of invertible matrices
- §2.5 Subspaces of \mathbb{R}^n
- §2.6 Dimension and rank
- §3.1 Introduction to determinants
- §3.2 Properties of determinants
- §4.1 Eigenvectors and eigenvalues
- §4.2 The characteristic equation
- §4.3 Diagonalization
- §4.4 Eigenvectors and linear transformations
- §4.5 Complex eigenvalues
- §4.6 Discrete dynamical systems
- §5.1 Inner product, length, and orthogonality
- §5.2 Orthogonal sets
- §5.3 Orthogonal projections
- §5.5 Least-square problems