

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, linear transformations and subspaces, determinants, eigenvalues and eigenvectors, diagonalization, and orthogonality. 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 that it is *not* the third edition of the book. Any edition of *Lay* will be fine, as long as you are willing to deal with the fact that the section numbers and problems vary from one edition to another.

Grading:

- Three homework sets (10%) due May 23, June 6 and Monday June 18;
- Two 50-minute midterm exams (20% each) on Wednesdays May 30 and June 13;
- 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 25 to 29, 2018 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.

Instructor: Dr. Tai-Peng Tsai, Math 109, phone 604-822-2591, ttsai@math.ubc.ca.

homepage: <http://www.math.ubc.ca/~ttsai/courses/221-18Q2/>

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 (skipped)
- §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
- §2.4 (skipped)
- §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