

Applied Linear Algebra — Outline for Exam 2

Sections 1.8–1.9, 2.1–2.3, 2.8–2.9, 3.1–3.3

Main ideas

- A. Working with linear transformations
- B. Working with matrices
- C. Subspaces of \mathbb{R}^n , bases, and dimension
- D. Determinants

Skills you should have

1. Be able to investigate and work with linear transformations
 - Be able to find the standard matrix for a linear transformation
 - Be able to determine if a given vector is in the range of linear transformation
 - Be able to determine if a linear transformation is one-to-one or onto (or both)
2. Be able to perform matrix operations
 - Be able to add, subtract, and multiply matrices (when defined)
 - Be able to multiply a matrix by a scalar and find the transpose of a matrix
 - Be able to find the inverse of a matrix, if it exists
 - When the matrix is 2×2 , there is a formula to use
 - When the matrix is larger than 2×2 , there is a process using row reduction
 - Know how to use A^{-1} to solve $A\mathbf{x} = \mathbf{b}$
3. Have an understanding of the definitions of the following terms: a subspace of \mathbb{R}^n , a basis for a subspace, the dimension of a subspace, the null space of a matrix, and the column space of a matrix
4. Be able to determine if a set of vectors is a basis for \mathbb{R}^n
5. Be able to find a basis for subspaces (and their dimension) in the following situations:
 - Be able to find a basis for the null space of a matrix
 - Be able to find a basis for the column space of a matrix
 - Be able to find a basis for the span of a set of vectors
6. Be able to compute determinants (using cofactor expansion or row-reduction to triangular form)
7. Be able to apply properties of the determinant
 - Two key properties are $\det(AB) = (\det A)(\det B)$ and $\det(A^{-1}) = (\det A)^{-1} = \frac{1}{\det A}$ (when $\det A \neq 0$)
 - Know that A is invertible if and only if $\det A \neq 0$
 - Know how to compute the area of parallelogram with a determinant of a 2×2 matrix

How to study

- I. Review core topics—make sure to have a working understanding of definitions and theorems
- II. Work lots of problems all of the way through—focus on WeBWorK problems and Handout problems
 - WeBWork #6–10 and first two problems in #11, Handout #7–13.
- III. Practice doing several problems in a short amount of time
- IV. Come talk with me if you have any questions