

Midterm 2 study guide

2.6 - Linear Transformations

- Definition: $T(\vec{x} + \vec{y}) = T(\vec{x}) + T(\vec{y})$ and $T(a\vec{x}) = aT(\vec{x})$
- Same as matrix transformation.
- How to get matrix from T ?
- Show that something is not a linear transformation.
- If T is a linear transfr and you know what it does to some vectors, what does it do to another?
- Rotation, projection, Reflection: don't memorize formulas, but understand how they behave

3.1 - Cofactor expansion

- How to find $\det(A)$ by expansion along a row or column
- How row/column operations affect $\det(A)$.
- Properties of $\det(A)$: zero row/col, 1 row multiple of another, etc.
- Upper/lower triangular matrices: determinant?

3.2 - Determinants and inverses

- $\det(AB) = \det(A) \det(B)$
- A invertible $\Leftrightarrow \det(A) \neq 0$.
- If A invertible, $\det(A^{-1}) = \frac{1}{\det A}$
- orthogonal matrix definition
- $\text{adj}(A)$ definition
- adjugate formula for inverse
- Cramer's Rule

3.3 - Diagonalization + eigenvalues

- eigenvalues / eigenvector definitions
- characteristic poly / how to compute eigenvalues
- How to find eigenvectors (lin. comb. of basic eigenvectors)
- A -invariance + connection to eigenvectors
- computations w/ diagonal matrices: D^k, D_1, D_2 , etc.
- diagonalizable def: $P^{-1}AP$ is diagonal for some P .
↑
diagonalizing matrix
- When is A diagonalizable?
 $n \times n$

* if it has n distinct eigenvalues,

* or if total # of basic eigenvectors is n .

- If A diagonalizable, how to find P , and what is $P^{-1}AP$?

4.1 - Vectors and lines

- length of a vector $\|\vec{v}\|$ and its properties
- parallelogram law for $\vec{v} + \vec{w}$.
- \vec{v} and \vec{w} parallel $\Leftrightarrow \vec{v} = a\vec{w}$, some $a \neq 0$.
- vector equation of a line
- parametric eqn of a line (break up into coordinates)
- How to find if two lines intersect? Parallel?
- Find eqn of line through two given points