

Revision Section #1

• Solving linear systems

- Row Reduction
- Echelon and the reduced echelon forms
- Pivots & pivot columns
- Free & basic variables
- Solutions
 - ↳ via free variables
 - ↳ via vector form for \vec{x} ("parametric vector form")
- Vector interpretation $A\vec{x} = \vec{b}$ and various properties of solution set as we fix A and vary \vec{b} .

\mathbb{R}^n

- Linear combinations
- Reinterpretation of linear systems via linear combinations
- Homogeneous vs nonhomogeneous linear systems in terms of "solution set" being a subspace of \mathbb{R}^n .
- Linear (in)dependence
 - Recall that any set containing $\vec{0}$ is lin. dep.
 - Any set of $> n$ vectors in \mathbb{R}^n is lin. dep.
 - how to verify linear dependence/indep.

Linear Transformations

- Linear, Matrix transformations
- "Linear" = "Matrix"?
- How to recover the standard matrix for the linear transformation
- Onto, One-to-one
their interpretation via columns of A

Lecture #28

- Matrices → Multiplication & its properties
 - Transposition & its properties
 - Inverse & its properties
 - Formula for A^{-1} when A is 2×2 -matrix
 - Algorithm for computing A^{-1} via row reduction of $(A|I)$
 - Characterization of invertible matrices (§2.3)
- Subspaces of \mathbb{R}^n
 - Definition
 - Span
 - $\text{Col}(A)$, $\text{Null}(A)$, $\text{Row}(A)$
 - Bases of subspaces
 - Bases for $\text{Col}(A)$, $\text{Null}(A)$, $\text{Row}(A)$ via echelon forms of A .
 - Dimension of a subspace
 - ↳ $\text{Rank}(A) := \dim \text{Col}(A)$.
 - $\dim \text{Col}(A) + \dim \text{Null}(A) = \# \text{ columns of } A$.

Lecture #28

- Determinants
 - cofactor expansion
 - ↳ det (triangular matrices)
 - computation via row reduction
 - A -invertible $\Leftrightarrow \det A \neq 0$
 - $\det(AB) = \det(A) \cdot \det(B)$ & $\det(A^T) = \det(A)$
 - Cramer's rule & Inverse formula
 - Area & Volume via det

- Vector Spaces
 - Definition & Examples
 - ↳ Subspaces
 - Linear combinations, Span
 - Linear transformations
 - ↳ Kernel, Range
 - Linear (in)dependence
 - Bases
 - ↳ Spanning set theorem (§4.3)
 - ↳ Bases for $\text{Col}(A)$, $\text{Row}(A)$, $\text{Null}(A)$
 - Dimension
 - ↳ Basis Thm (§4.5)