What You Need to Know

- Definitions

  e.g., linear independence, basis, null space

- Concepts (including Theorems)

  e.g., A basis is (by definition) a linearly independent spanning set. Related concepts:

  - Spanning Set Theorem
  - Basis Theorem
  - Calculating a basis for Span$\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is same as calculating a basis for Col $\begin{bmatrix}\mathbf{v}_1 & \mathbf{v}_2 & \mathbf{v}_3\end{bmatrix}$.

- Algorithms

  e.g.,

  - Find a basis for Col A
  - Orthogonalize a set
  - Normalize a vector
  - Orthogonally diagonalize a symmetric matrix

Advice on Definitions

1. concentrate on important ones

   What's important? Well, I've mentioned "basis" and "eigenvector" about a million times each. Look in the index, too.

2. memorize the concept, not the wording

Advice on Concepts

1. geometric interpretation can help (but don't get obsessed with it)

2. look at "theory questions" on quizzes and in homework

3. try to make new connections

   e.g., rank equals number of pivot positions, so if rank equals number of rows of $m \times n$ matrix, then its columns span all of $\mathbb{R}^m$, so $\operatorname{Col} A = \mathbb{R}^m$.

Advice on Algorithms

Look at the quizzes (and homework):

Quiz	Algorithms
1	– solve linear system
	– is $\mathbf{w} \in \text{Span}\{\mathbf{u}, \mathbf{v}\}$?
2	– solve homogeneous
	– use to solve nonhomogeneous
	– is set linearly independent?
3	– find standard matrix
4	– invert 2×2
	– determinant by cofactor expansion
	– inverse using $\begin{bmatrix} A & I \end{bmatrix}$
5	– get inverse/determinant with EROs
6	– find basis for $\text{Col}\, A$, $\text{Nul}\, A$
7	– determinant of triangular matrix
	– find eigenspace basis
	– diagonalize 2×2
8	– project $\mathbf{v}$ onto $\text{Col}\, A$
9	– find $(\text{Col}\, A)^{\perp}$
	– find least-squares solutions
	– perform QR factorization
	– orthogonally diagonalize matrix