Review sheet for exam 3

The exam covers sections 4.6, 4.7, and 5.1-5.5. To study for this exam, I highly recommend doing as many of the practice and discussion problems as you can handle.

You may use a cheat sheet for this exam. **Your sheet must be written by hand by you**. You may use one side of **half** of a sheet of 8.5in $\times$11in paper. I'll collect your sheets with your exams. They will be returned.

Below, I've listed the topics that the exam will cover.

- 4.6: Rank
  - What is the row space of a matrix? How do row operations affect the row space?
  - What is the rank of a matrix?
  - What does the Rank (-Nullity) Theorem say? Think about the intuitive picture we talked about in class (the author talks about this in Example 4).
  - See the Theorem on page 235. You can extend the characterizations of invertible matrices using the concepts introduced in chapter 4. I think it should be clear to you why these things are true.
- 4.7: Change of basis
  - How is the change of coordinates matrix defined? Can you compute it for examples in $\mathbb{R}^n$? Try a handful of examples.
- 5.1: Eigenvalues and eigenvectors
  - What is an eigenvector? What is an eigenvalue?
  - How can you find the eigenvalues of a triangular matrix?
  - What can you say about eigenvectors corresponding to distinct eigenvalues with respect to dependence?
- 5.2: The characteristic equation
  - What is the characteristic equation? What is the characteristic polynomial?
  - How can you use the characteristic equation to compute eigenvalues?
  - What does it mean for two matrices to be similar?
- 5.3: Diagonalization

  - What does it mean for a matrix to be diagonalizable?
  - When can a matrix be diagonalized? How do you do it?

- 5.4: Eigenvectors and linear transformations
  - How can you compute the matrix for a linear transformation relative to two bases?
  - How do you compute the eigenvalues for a general linear transformation?

- 5.5: Complex eigenvalues
  - Can you do basic complex arithmetic?
  - What do complex eigenvalues tell you about a matrix? See Theorem 9.