Review for Test 2:

- Chapter 2: §2.2-2.3

  §2.2 "Inverse of a Matrix"

  - Be able to find an inverse of a matrix using the algorithm in this section.
  - Know the properties in Theorem 5, Theorem 6, and Theorem 7 for inverses.

  §2.3 "Characterizations of Invertible Matrices"

  - Be familiar with the conditions in the IMT and the implications when answering short answer questions like 11-32 in §2.3.

- Chapter 4: 4.1-4.6

  §4.1: "Vector Spaces and Subspaces"

  - Be familiar with the axioms of a vector space.
  - Be able to show whether or not a subset is a subspace (three requirements).
  - Be able to use and prove the fact that the the span of a subset of vectors in a vector space V is always a subspace of V.

  §4.2: "Null Spaces, Column Spaces, and Linear Transformations"

  - Know the definition of the null space, understand Theorem 2, and be able to explicitly find the Nul(A) and determine if a vector $\vec{v}$ is in the Nul(A).
  - Know the definition of the column space, understand Theorem 3 and the blue box on page 230, and be able to determine if a vector $\vec{v}$ is in the Col(A).
  - Understand the terminology of kernel and range when referring to a linear transformation, T.

  §4.3: "Linearly Independent Sets; Bases"

  - Know the definition of a basis.
  - Be able to find bases for Nul(A) and Col(A).

  §4.4: "Coordinate Systems"

  - Know the definition of a coordinate vector.
  - Given a coordinate vector and a basis, be able to find the vector in standard coordinates.
  - Given a vector in standard coordinates and an ordered basis, be able to determine the coordinate vector.
  - Understand the change of coordinates matrix.
  - Be able to use Theorem 8 to determine if two spaces are isomorphic or if a subset of a vector space V is a basis or not (see Ex. 6 and Ex. 7 on p.251-252).

  §4.5: "Dimension of a Vector Space"

  - Understand Theorem 9 and Theorem 10.
  - Know the definition of dimension of a vector space.
  - Understand Theorem 11 and Theorem 12.
  - Be able to find the dimension of Nul(A), Col(A), or any subspace.
  - Understand the blue box on p.260

§4.6: "Rank"

- Know the definition of row space and be able to determine Row(A).
- Know the definition of rank and be able to determine rank(A).
- Know the rank theorem (Theorem 14).
- Understand the additions to the IMT from the rank(A).

- Chapter 3: 3.1 §3.1: "Introduction to Determinants"
  - Know how to find the determinant of a matrix using cofactor expansion.
  - Know that if det(A) = 0, then A is singular (A is NOT invertible).
  - Know that det(AB) = det(A)det(B).
- Chapter 5: 5.1-5.3 §5.1: "Eigenvectors and Eigenvalues"
  - Know the definition of an eigenvalue, an eigenvalue, and an eigenspace.
  - Be able to check if $\vec{v}$ is an eigenvector of A (see if there is a λ such that $A\vec{x} = \lambda\vec{x}$).
  - Be able to check if λ is an eigenvalue of A (see if $(A - \lambda I)\vec{x} = \vec{0}$ has a solution, $\vec{x}$).
  - Be able to use Theorem 2.

  §5.2: "The Characteristic Equation"

  - Be able to find the characteristic polynomial and the characteristic equation for a matrix A.
  - Be able to solve the characteristic equation and find all eigenvalues of A (solve $\det(A - \lambda I) = 0$).
  - Know the definition of Similar Matrices and understand Theorem 3.

  §5.3: "Diagonalization"

  - Know the definition of a diagonalizable matrix (A is similar to a diagonal matrix D).
  - Know Theorem 5.
  - Be able to find the general form of A^k if A is diagonalizable.
  - Know the 4 steps on pages 321-322 to diagonalize a matrix (when possible).
  - Know when a matrix will or will not be diagonalizable by using a multiplicity/dimension argument. See Theorem 7.