The following is only a rough outline of the material that we have covered since the first midterm. I have indicated the approximate sections where the material can be found in the textbook. You are expected to know the material tested on the previous midterm as well. The midterm is not necessarily limited to the scope of the outline below.

**Chapter 4**

§4.3 Properties of the determinant: for example, multiplicative function; non-zero iff invertible; transpose has the same determinant; Cramer’s rule.

§4.4 Though we did not cover this section in lecture, it is a valuable study resource as it gathers the essential facts of the determinant and presents it in a compact fashion.

**Chapter 5**

§5.1 Diagonalizability; eigenvectors; eigenvalues; characterization of diagonalizability in terms of eigenbasis; characteristic polynomial; properties of the characteristic polynomial.

§5.2 Testing for diagonalizability; linear independence of eigenvectors corresponding to distinct eigenvalues; splitting of polynomials; algebraic multiplicity of a root of a polynomial; eigenspace; relationship between the dimension of the eigenspace and the algebraic multiplicity of an eigenvalue; relationship between eigenspaces corresponding to distinct eigenvalues; characterization of diagonalizability in terms of splitting and full eigenspace dimension; sums of subspaces; direct sums of subspaces; characterization of diagonalizability in terms of the direct sum.

§5.4 $T$-invariant subspaces; $T$-cyclic subspaces generated by a vector; characteristic polynomial on a $T$-invariant subspace; basis and characteristic polynomial for a $T$-cyclic subspace; Cayley-Hamilton theorem for operators; Cayley-Hamilton theorem for matrices.

**Chapter 6**

§6.1 Inner products; conjugate transpose/adjoint of matrices; properties of inner products; norms; properties of norms; orthogonal vectors; unit vectors; orthonormal vectors.

§6.2 Orthonormal bases; properties of orthogonal subsets, especially in relation to the span; Gram-Schmidt process and its consequences; orthogonal complement; orthogonal projection; orthonormal sets, their extensions, and consequences.

§6.3 Riesz representation theorem; adjoint of a linear operator; relation to matrix adjoint; properties of the adjoint.