Topics for Exam 2

1. **Euclidean Inner Product and Euclidean Norm**

   1.1 Row–column product

   1.2 Euclidean inner product and Euclidean norm

   1.3 Orthogonality

2. **Matrices**

   2.1 The set, $\mathbb{M}(m, n)$, of $m \times n$ matrices as a linear space

   2.2 Matrix Algebra

   2.3 Null space, column space and row space of a matrix

   2.4 Invertible matrices

3. **Linear Transformations**

   3.1 Definition of linearity

   3.2 Matrix representation

   3.3 Null space; image; the Dimension Theorem

   3.4 Compositions

   3.5 One–to–one, onto, and invertible linear transformation

4. **The Eigenvalue Problem**

   4.1 Eigenvalues, eigenvectors and eigenspaces

   4.2 The eigenvalue problem

   4.3 Rotations and reflections in $\mathbf{R}^2$.

Relevant sections in text: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 4.1 and 4.2

Relevant sections in the online class notes: 2.12, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1 and 5.2

Relevant assignments: 12, 13, 14, 15, 16, 17, 18, 19, 20 and 22

Important Concepts: Inner product; orthogonal vectors; linear transformation; null space; image; one–to–one functions; onto functions; invertible functions; eigenvalue; eigenvector; eigenspace.

Important Skills: Know how to compute inner products; know how to compute matrix products; know how to tell whether a given matrix is invertible or not; know how to compute inverses of invertible matrices; know how to determine whether a given function is linear or not; know how to obtain matrix representations of linear transformations; know how to compute determinants of 2×2 matrices; know how to find eigenvalues, eigenvectors and eigenspaces of linear transformations.