

**Topics for Exam 1****1. Vector Space Structure in Euclidean Space**

- 1.1 Definition of  $n$ -Dimensional Euclidean Space
- 1.2 Vector addition and scalar multiplication
- 1.3 Spans
- 1.4 Linear independence

**2. Subspaces of Euclidean Space**

- 2.1 Bases
- 2.2 Dimension
- 2.3 Coordinates

**3. Connections with the Theory of Linear Equations**

- 3.1 Homogeneous systems
- 3.2 Fundamental Theorem for homogenous systems of linear equations
- 3.3 Nonhomogeneous systems

**4. Euclidean Inner Product and Norm**

- 4.1 Row-column product
- 4.2 Euclidean inner product
- 4.3 Euclidean norm
- 4.4 Orthogonality

**Relevant sections in text:** 1.5, 1.8, 2.2, 2.3, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1, 4.3, 4.4.

**Relevant chapters in the online class notes:** Chapter 2

**Important Concepts:** Euclidean space, linear independence, span, subspaces, bases, dimension, coordinates, inner product, norm and orthogonality

**Important Skills:** Know how to determine whether subsets of  $\mathbf{R}^n$  are linearly independent; know how to tell whether a given subset of  $\mathbf{R}^n$  is a subspace; know how to tell whether a set of vectors in  $\mathbf{R}^n$  spans a subspace; know how to compute the span of a set of vectors; know how to solve systems of linear equations; know how to determine bases for subspaces of Euclidean space; know how to compute dimensions of subspaces; know how to find coordinates of vectors relative to ordered bases; know how to tell whether vectors are orthogonal.