

Chapter 1: Foundations

1 Foundations

This chapter covers the fundamental concepts of linear algebra that form the foundation for all subsequent material.

In this chapter, we will explore:

- **Vector Spaces:** The abstract framework for studying linear structures
- **Linear Maps:** Transformations that preserve linear structure

These concepts are essential for understanding spectral theory and optimization techniques covered in later chapters.

1.1 Prerequisites

Before proceeding, readers should be familiar with:

- Basic matrix operations (addition, multiplication, transpose)
- Systems of linear equations
- Elementary row operations and Gaussian elimination