

Real Analysis 1, MATH 5210, Spring 2025

Homework 6, Hong/Wang/Gardner Section 5.1. Groups, Fields, and Vector Spaces

Due Saturday, March 8, at 11:59 p.m.

Write in complete sentences and paragraphs!!! *Explain* what you are doing and convince me that you understand what you are doing and why. Justify all steps by quoting relevant results from the textbook or hypotheses. Use the notation and techniques described in the in-class hints. Do not discuss homework problems with others. If you have any questions, then contact me (gardnerr@etsu.edu).

5.1.4. Consider the vector space $\mathcal{P}_n$ of all polynomials of degree at most n . Find a basis for this space and find the matrix which represents the differentiation operator with respect to this basis.

5.1.10. If T is a linear transformation from one vector space to another, then the set of vectors mapped to $\mathbf{0}$ under T is called the *kernel* of T . Prove that the kernel of T is a vector space.