

# MATH70063: Algebra 4

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# Contents

# Chapter 1

## A Crash Course on Category Theory

The objective of this course is to develop a comprehensive toolkit to study a very broad class of mathematical objects, such as abelian groups, modules over commutative rings, vector spaces, and more. Broadly speaking, these objects are all **categories**, and the toolkit we will develop will apply to a specific kind of categories known as **abelian categories**.

Before we develop the homological algebra toolkit, we will need to develop a basic understanding of category theory. This will be the primary focus of this chapter. In so doing, we will be able to understand the theory of abelian categories and understand the broader context in which the theory of homological algebra is applicable.

### 1.1 Categories and Functors

### 1.2 Natural Transformations

### 1.3 Categorical Constructions

For the latest version of these notes, visit <https://thefundamentaltheor3m.github.io/HomAlgNotes/LastLocallyCompiled.pdf>. For any suggestions or corrections, please feel free to fork my repository and make a pull request.