Solutions to Michael Atiyah and Ian MacDonald's
Introduction to Commutative Algebra

Patrick Borse

ABSTRACT. This document contains solutions to the exercises of Michael Atiyah and Ian MacDonald's *Introduction to Commutative Algebra*.

Contents

CHAPTER 1

Rings and Ideals

Exercise 1.1.
Exercise 1.2.
Exercise 1.3.
Exercise 1.4.
Exercise 1.5.
Exercise 1.6.
Exercise 1.7.
Exercise 1.8.
Exercise 1.9.
Exercise 1.10.
Exercise 1.11.
Exercise 1.12.
Exercise 1.13.
Exercise 1.14.
Exercise 1.15.
Exercise 1.16.
Exercise 1.17.
Exercise 1.18.
Exercise 1.19.
Exercise 1.20.
Exercise 1.21.
Exercise 1.22.
Exercise 1.23.
Exercise 1.24.
Exercise 1.25.
Exercise 1.26.
Exercise 1.27.
Exercise 1.28.

Modules

Exercise 2.1.

Exercise 2.2.

Exercise 2.3.

Exercise 2.4.

Exercise 2.5.

Exercise 2.6.

Exercise 2.7.

Exercise 2.8.

Exercise 2.9.

Exercise 2.10.

Exercise 2.11.

Exercise 2.12.

Exercise 2.13.

Exercise 2.14.

Exercise 2.15.

Exercise 2.16.

Exercise 2.17.

Exercise 2.18.

Exercise 2.19.

Exercise 2.20.

Exercise 2.21.

Exercise 2.22.

Exercise 2.23.

Exercise 2.24.

Exercise 2.25.

Exercise 2.26.

Exercise 2.27.

Exercise 2.28.

Rings and Modules of Fractions

Exercise 3.1.

Exercise 3.2.

Exercise 3.3.

Exercise 3.4.

Exercise 3.5.

Exercise 3.6.

Exercise 3.7.

Exercise 3.8.

Exercise 3.9.

Exercise 3.10.

Exercise 3.11.

Exercise 3.12.

Exercise 3.13.

Exercise 3.14.

Exercise 3.15.

Exercise 3.16.

Exercise 3.17.

Exercise 3.18.

Exercise 3.19.

Exercise 3.20.

Exercise 3.21.

Exercise 3.22.

Exercise 3.23.

Exercise 3.24.

Exercise 3.25.

Exercise 3.26.

Exercise 3.27.

Exercise 3.28.

Exercise 3.29.

Exercise 3.30.

Primary Decomposition

Exercise 4.1.

Exercise 4.2.

Exercise 4.3.

Exercise 4.4.

Exercise 4.5.

Exercise 4.6.

Exercise 4.7.

Exercise 4.8.

Exercise 4.9.

Exercise 4.10.

Exercise 4.11.

Exercise 4.12.

Exercise 4.13.

Exercise 4.14.

Exercise 4.15.

Exercise 4.16.

Exercise 4.17.

Exercise 4.18.

Exercise 4.19.

Exercise 4.20.

Exercise 4.21.

Exercise 4.22.

Exercise 4.23.

Integral Dependence and Valuations

Exercise 5.1.

Exercise 5.2.

Exercise 5.3.

Exercise 5.4.

Exercise 5.5.

Exercise 5.6.

Exercise 5.7.

Exercise 5.8.

Exercise 5.9.

Exercise 5.10.

Exercise 5.11.

Exercise 5.12.

Exercise 5.13.

Exercise 5.14.

Exercise 5.15.

Exercise 5.16.

Exercise 5.17.

Exercise 5.18.

Exercise 5.19.

Exercise 5.20.

Exercise 5.21.

Exercise 5.22.

Exercise 5.23.

Exercise 5.24.

Exercise 5.25.

Exercise 5.26.

Exercise 5.27.

Exercise 5.28.

Exercise 5.29.

Exercise 5.30.

Exercise 5.31.

Exercise 5.32.

Exercise 5.33.

Exercise 5.34.

Exercise 5.35.

CHAPTER 6

Chain Conditions

Exercise 6.1.

Exercise 6.2.

Exercise 6.3.

Exercise 6.4.

Exercise 6.5.

Exercise 6.6.

Exercise 6.7.

Exercise 6.8.

Exercise 6.9.

Exercise 6.10.

Exercise 6.11.

Exercise 6.12.

CHAPTER 7

Noetherian Rings

Exercise 7.1.

Exercise 7.2.

Exercise 7.3.

Exercise 7.4.

Exercise 7.5.

Exercise 7.6.

Exercise 7.7.

Exercise 7.8.

Exercise 7.9.

Exercise 7.10.

Exercise 7.11.

Exercise 7.12.

Exercise 7.13.

Exercise 7.14.

Exercise 7.15.

Exercise 7.16.

Exercise 7.17.

Exercise 7.18.

Exercise 7.19.

Exercise 7.20.

Exercise 7.21.

Exercise 7.22.

Exercise 7.23.

Exercise 7.24.

Exercise 7.25.

Exercise 7.26.

Exercise 7.27.

CHAPTER 8

Artin Rings

Exercise 8.1.

Exercise 8.2.

Exercise 8.3.

Exercise 8.4.

Exercise 8.5.

Exercise 8.6.

CHAPTER 9

Discrete Valuation Rings and Dedekind Domains

Exercise 9.1.

Exercise 9.2.

Exercise 9.3.

Exercise 9.4.

Exercise 9.5.

Exercise 9.6.

Exercise 9.7.

Exercise 9.8.

Exercise 9.9.

Completions

Exercise 10.1.

Exercise 10.2.

Exercise 10.3.

Exercise 10.4.

Exercise 10.5.

Exercise 10.6.

Exercise 10.7.

Exercise 10.8.

Exercise 10.9.

Exercise 10.10.

Exercise 10.11.

Exercise 10.12.

Dimension Theory

Exercise 11.1.

Exercise 11.2.

Exercise 11.3.

Exercise 11.4.

Exercise 11.5.

Exercise 11.6.

Exercise 11.7.