151 Discrete Mathematics
K. Rosen, Discrete Mathematics and Its Applications, 7th edition

Chapter 1 The Foundations: Logic and Proofs

1.1. Propositional Logic
Ex.1, Ex.2, Def.1, Ex.3, Ex.4, Def.2, Ex.5, Def.3, Ex.6, Def.5, Ex.7, converse, contrapositive, inverse, Def.6, Ex.10, Ex.11, precedence of logical operators.

1.3. Propositional Equivalences
Def.1, Ex.1, Def.2, Ex.2, Ex.3, Ex.4, Table 6, Table 7, Table 8, Ex.5, Ex.6, Ex.7, Ex.8.

1.4. Predicates and Quantifiers
Ex.1, Ex.2, Ex.3, Ex.4, Ex.5, $P(x_1, x_2, \cdots, x_n)$, Def.1, Ex.8, Ex.9, Ex.10, Ex.11, Ex.13, Def.2, Ex.14, Ex.15, Ex.16, Ex.17, negating expressions, Table 2, Ex.21, Ex.22.

1.6. Rules of Inference
Def.1, Ex.2. Write the followings using the argument form and check if the argument is valid: Ex.3, Ex.4, Ex.5, Ex.6, Ex.7, Ex.8, Ex.9, Ex.10, Ex.11.

1.7. Introduction to Proofs
Def.1, Ex.1, Ex.2, Ex.3, Ex.4, Ex.5, Ex.6, Def.2, Ex.7, Ex.8, Ex.10, Ex.11, Ex.12, Ex.13, Ex.14, Ex.15, Ex.18.

1.8. Proof Methods and Strategy
Ex.1, Ex.3, Ex.4, Ex.6, Ex.7, Ex.9, Ex.10, Ex.13, Ex.17.

Chapter 2 Basic Structures: Sets, Functions, Sequences, Sums, and Matrices

2.1. Sets
Def.1, Ex.1, Ex.2, Ex.3, Ex.4, definitions for $\mathbb{N}$, $\mathbb{Z}$, etc., definitions for intervals, Def.2, Ex.6, Ex.7, Def.3, Ex.8, Ex.9, Th.1(no proof), Def.4, Ex.10, Def.5, Ex.13, Def.6, Ex.14, Ex.15, Def.8, Ex.17, Ex.18, Ex.20.

2.2. Set Operations
Def.1, Ex.1, Def.2, Ex.3, Def.3, Ex.5, Def.4, Ex.6, Def.5, Ex.9, Table 1, Def.6, Def.7, Ex.15.

Chapter 5 Induction and Recursion

5.1. Mathematical Induction
Ex.1, Ex.2, Ex.3, Ex.4, Ex.5, Ex.6, Ex.8, Ex.11.

5.2. Strong Induction andWell-Ordering
Ex.2.

Q.1. Let $\{a_n\}$ be a sequence defined inductively as:

$$a_1 = 1, a_2 = 2, a_{n+1} = 2a_n + a_{n-1}, \quad \forall\, n \geq 2.$$

Prove that $a_n \leq \left(\frac{5}{2}\right)^n$, for all $n \geq 2$.

Chapter 9 Relations

9.1. Relations and Their Properties

Ex.2, Ex.3, Def.2, Ex.4, Ex.5, Def.3, Ex.7, Ex.8, Ex.9, Def.4, Ex.10, Ex.11, Ex.12, Def.5, Ex.13, Ex.14, Ex.15, Ex.17, Ex.18, Ex.19, Def.6, Ex.20, Ex.21, Def.7, Ex.22, Th.1 (no proof).

9.3. Representing Relations

Def.1, Ex.7, Ex.8, Ex.9, Ex.10.

9.4. Closures of Relations

Ex.1, Ex.2, Def.2, Th. 2(without proof).

Q.1. If $R = \{(1,1),(2,1),(3,2),(4,3)\}$ is a relation on the set $A = \{1,2,3,4\}$, find R^*.

9.5. Equivalence Relations

Def.1, Def.2, Ex.1, Ex.2, Ex.3, Ex.6, Ex.7, Def.3, Ex.8, Ex.9, Th.1 (no proof), Ex.12, Ex.14.

9.6. Partial Orderings

Def.1, Ex.1, Ex.2, Ex.3, Ex.4, Def.2, Ex.5, Def.3, Ex.6, Ex.7, Hasse diagrams, Ex.12, Ex.13.

Chapter 10 Graphs

10.1. Graphs and Graph Models

All until graph models (which is not included).

10.2. Graph Terminology and Special Types of Graphs

Def.1, Def.2, Def.3, Ex.1, Th.1, Ex.3, Th.2 (no proof), Def.4, Ex.5, Ex.6, Ex.7, Def.6, Ex.9, Ex.10, Ex.11, Ex.13, Def.7, Def.8, Ex.18, removing vertices from a graph.

10.3. Representing Graphs and Graph Isomorphism

Ex.1, Def.1, Ex.8, Ex.9, Ex.10.

10.4. Connectivity

Def.1, Ex.1, Def.2, Def.3, Ex.4, Th.1 (no proof), Ex.5.

10.7. Planar Graphs

Def.1, Ex.1, Ex.3, Th.1 (no proof), Ex.4, Cor.1 (no proof), Cor.2 (no proof), Ex.5, Cor.3, Ex.6.

Chapter 11 Trees

11.1. Introduction to Trees

Def. 1, Ex.1, Th.1(no proof), Def. 2, Ex.2, Def.3, Ex.4, Th.2(no proof), Ex. 10, Ex. 11.

11.2. Applications of Trees

Ex.1.

11.4. Spanning Trees

Def.1, Ex.1.

Chapter 12 Boolean Algebra

12.1. Boolean Functions

Ex.1, Ex.2, Ex.3, Ex.4, Ex.5, Ex.8, Table 5, Ex.9, Ex.10, Ex.11, Ex.12, Def.1.

12.2. Representing Boolean Functions

Ex.1, Ex.2, Ex.3, Def.1, only the definition of sum of products; functional completeness is not included.

12.3. Logic Gates

All section, except Ex.2 and adders.

12.4. Minimization of Circuits

Ex.1, Ex.2, Ex.3, Ex.4 and all definitions up to pag. 835.