Solutions Notebook for Introduction to Topological Manifolds by John M. Lee

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Contents

Chapter 2

Topological Spaces

Exercise 2.10. Show that a subset of a topological space is closed if and only if it contains all of its limit points.

Appendix A

Review of Set Theory

Exercise A.1. Suppose A is a set and $\mathscr{C}$ is a collection of sets. Prove the following properties of unions and intersections.

(a) Distributive Laws:

$$A \cup \left(\bigcap_{X \in \mathscr{C}} X \right) = \bigcap_{X \in \mathscr{C}} (A \cup X)$$

$$A \cap \left(\bigcup_{X \in \mathscr{C}} X \right) = \bigcup_{X \in \mathscr{C}} (A \cap X)$$

(b) DeMorgan's Laws:

$$A \setminus \left(\bigcap_{X \in \mathscr{C}} X \right) = \bigcup_{X \in \mathscr{C}} (A \setminus X)$$

$$A \setminus \left(\bigcup_{X \in \mathscr{C}} X \right) = \bigcap_{X \in \mathscr{C}} (A \setminus X)$$