Chapter 4. Countability and Separation Axioms

Note. With this chapter, we complete the "irreducible core" (see Munkres' page xii) of an introductory topology course. After this chapter, we are prepared to cover any of the other chapters in Part I, or Chapter 9 (The Fundamental Group) of Part II (Algebraic Topology). After Chapter 9, other chapters of Part II are accessible (see the dependence diagram for Part II on page xii).

Note. The topics of this chapter are less motivated by analysis (such as the topics of compactness and connectedness of Chapter 3) and more motivated by the study of topology itself. Munkres declares "our basic goal" in this chapter is the proof of the Urysohn Metrization Theorem (Theorem 34.1), which deals with the condition under which a topological space can be embedded in a metric space. Another embedding theorem (Theorem 36.2) states that a compact m-manifold can be embedded in $\mathbb{R}^N$ for some $B \in \mathbb{N}$. An m-manifold is like an m-dimensional surface (manifolds are studied in detail in the area of differential geometry).

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