BACKGROUND TOPICS FROM POINT SET TOPOLOGY

Reference: *Topology, Second Edition*, by J. R. Munkres

Set Theory and Logic

§§ 1–7
Summary of standard set-theoretic concepts.

§ 9
Galileo's characterization of infinite sets (Thm. 9.1, p. 57), the Axiom of Choice.

§ 11
Zorn's Lemma, related statements and simple applications (*e.g.*, Exercise 8, p. 72).

Topological Spaces

§ 12–13
Definition of a topological space, different topologies on a given set, bases and subbases for a topology.

§ 15–18
Finite product topologies, subspace topologies (but not the material on order topologies), closed sets and limit points, closures and interiors of sets, neighborhoods, the Hausdorff separation property (= the T_2 axiom), continuous functions, homeomorphisms, constructing new continuous functions from old ones, some standard exercises (2, 3, 4, 6, 8, 9, 11, 12, 13 on pp. 100–102; 4, 5, 9, 10, 11, 13 on pp. 111–112).

§ 20–21
Metric spaces and their open sets, metrics associated to the product topology, the $\varepsilon - \delta$ characterization of continuity, sequences and limit points, continuity and sequences, some standard exercises (1, 3, 12 on pp. 133–134).

§ 22
Quotient topologies, quotient maps, recognition of quotient maps, some standard exercises (2, 3, 4, 5 on pp. 144–145).

Spaces with Special Properties

§ 23–29
Connected spaces, products and images of connected spaces, unions and closures of connected sets, connectedness of the real numbers, connected components of a space, local conectedness, path connectedness, compactness, compactness and closed subsets, products and images of compact spaces, important properties (*e.g.*, Thm. 26.6 on p. 167 and Lemma 26.8 on p. 168), the finite intersection property, compactness in Euclidean spaces, Lebesgue numbers, uniform continuity, compactness and metric spaces (Thm. 28.2 on pp. 179–180), local compactness, one point (Alexandrov) compactifications.

§ 30
Second countability, some standard exercises (3, 4, 13 on p. 194).