MATH104: Topology **Fall 2023**

Homework 7

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Chapter 9 (The Fundamental Group) Problems.

Section 60 (Fundamental Groups of Some Surfaces), 60.2

Let X be the quotient space obtained from B^2 by identifying each point x of S^1 with its antipode $-x$. Show that X is homeomorphic to the projective plane P^2.

Solution. ■

Section 63 (The Jordan Curve Theorem), 63.1

Let C_1 and C_2 be disjoint simple closed curves in S^2.

a) **Show that $S^2 - C_1 - C_2$ has precisely three components. [*Hint:* If W_1 is the component of $S^2 - C_1$ disjoint from C_2, and if W_2 is the component of $S^2 - C_2$ disjoint from C_1, show that $\overline{W}_1 \cup \overline{W}_2$ does not separate S^2.]**

b) **Show that these three components have boundaries C_1 and C_2 and $C_1 \cup C_2$, respectively.**