

Math 232 Homework 3

Quiz on Hwks 1-3 on September 14th 2017

1. Let A_1, A_2, A_3 be compact sets in \mathbb{R}^3 . Use the Borsuk-Ulam theorem to show that there is one plane $P \subset \mathbb{R}^3$ that simultaneously divides each A_i into two pieces of equal measure.
2. Show that the complement of a finite set of points in \mathbb{R}^n is simply connected if $n \geq 3$.
3. Let G be a group with a presentation

$$\langle x, y \mid x^3yx^{-5}y^{-1} \rangle$$

and let N be the smallest normal subgroup containing the element y . Compute the group G/N , and justify your answer.

4. Consider the space X obtained by from two tori $S^1 \times S^1$ by identifying a circle $S^1 \times \{x_0\}$ in one with the corresponding circle $S^1 \times \{x_0\}$ in the other. (We saw this in class.)
Show that the fundamental group $\pi_1(X)$ is not abelian.