

## In-class problems: Revision

1. Show that  $[0, 1]/\{0, 1\} \cong S^1$ .
2. Consider two points  $x \in X$  and  $y \in Y$  in two disjoint path-connected subsets  $X, Y \subset \mathbb{R}^n$ . Consider their wedge-sum

$$X \vee Y = (X \cup Y)/\{x, y\}.$$

Show that  $X \vee Y$  is path-connected.

3. Given an example for a topological space, which is not Hausdorff.
4. Show that the product space  $X \times Y$  of two Hausdorff spaces  $X$  and  $Y$  is Hausdorff.
5. Prove that  $\{-1, 1\}$  is not a retract of  $\mathbb{R}$ .
6. What is the fundamental group of  $\mathbb{R}^2 \setminus \{0\}$ ?