

Algebraic and Geometric Methods in Engineering and Physics

Homework 10

Due on December 14

1. Consider the following collection of subsets of \mathbb{R} :

$$\mathcal{T}^c = \{U \subset \mathbb{R} : U^c \text{ is finite}\} \cup \{\emptyset\}.$$

- (a) Show that \mathcal{T}^c is a topology in \mathbb{R} .
- (b) Is this topology Hausdorff?

2. For the topology \mathcal{T}^c in \mathbb{R} , show that:

- (a) The function $f(x) = \sin(x)$ is not continuous;
- (b) Any subset $K \subset \mathbb{R}$ is compact;
- (c) $\mathbb{R} \setminus \{0\}$ is connected.