MATH 5703	**Topology I**	Fall 2014
Section: 001	MWF 10:45 – 11:35	Prof. Matthew Clay
	MAIN 322	

Homework 4

1. Let C be a countable subset of $\mathbb{R}^n$ where $n \geq 2$. Prove that $\mathbb{R}^n - C$ is path connected.

2. Show that S^n is path connected for $n \geq 1$.

3. Let $S = \{(tp, 1-t) \in \mathbb{R}^2 \mid t \in [0,1] \text{ and } p \in \mathbb{Q} \cap [0,1]\}$. Show that S is path connected but only locally connected at $(0,1)$. Find a subspace $T \subseteq \mathbb{R}^2$ that is path connected but not locally connected at any point.

4. Prove that a compact subspace of a metric space is closed and bounded.

5. Show that is Y is compact and $C \subseteq X \times Y$ is closed, then the projection $\pi_X(C) \subseteq X$ is closed, i.e., π_X is a *closed map*. Find a counter-example to show that the statement is false if we drop the assumption that Y is compact.