

Mathematics 205C, Spring 2011, Assignment 1

This will be due on **Wednesday, February 1, 2012, at 11:10 A.M.** at the beginning class or by prior arrangement in my mailbox or at the front desk of Surge 202 at the same time. If you wish to use some version of T_EX in writing up your answers, please feel free to do so. *You must show the work behind or reasons for your answers.*

1. Let X and Y be spaces that are Hausdorff, connected and locally arcwise connected, and assume further that X is simply connected. If $p : W \rightarrow X \times Y$ is a covering space projection and W is connected, prove that it is equivalent to a covering space projection of the form $\text{id}_X \times q$ for some covering space projection $q : W' \rightarrow Y$ where W' is connected.

2. Let $U \subset \mathbb{C}$ be an open subset of the complex plane which does not contain 0, and let $n > 1$ be an integer. An n^{th} **root function** on U is defined to be a function $W_n : U \rightarrow \mathbb{C} - \{0\}$ such that $z = W_n(z)^n$ for all $z \in U$. Prove that there is an n^{th} root function on U if U is simply connected. [*Hint:* Prove that the n^{th} power map $\psi^n : \mathbb{C} - \{0\} \rightarrow \mathbb{C} - \{0\}$, which sends z to z^n , is an n -sheeted covering space projection using polar coordinates on $\mathbb{R}^2 \cong \mathbb{C}$.]