Mathematics 205B, Winter 2019, Assignment 1

This will be due on **Monday, February 4, 2019, at 9:10 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 $\TeX$ 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 be a space which is Hausdorff, connected and locally arcwise connected, let $f : (X, x) \to (S^1, 1)$ be a continuous mapping, and let $p : \mathbb{R} \to S^1$ be the map $p(t) = \exp(2\pi i t)$. Prove that f lifts to a map $F : X \to \mathbb{R}$ if and only if f is basepoint preservingly homotopic to a constant mapping.

2. Let X be a space which is Hausdorff, connected and locally arcwise connected, let $x \in X$, and assume further that $\pi_1(X, x)$ is finite of order n. Prove that, up to equivalence, there are only finitely many connected covering spaces of X, and give an upper bound $B(n)$ for the number of equivalence classes of coverings as an explicit, elementary function of n.