UF MTG 4303/5317
Introduction to Topology 2
Spring 2024

Homework 1

Due Wednesday, January 24, anytime, on Canvas

Reading. Munkres §51–53.

Problems.

1. Let X be a topological space. Let f be a loop in X based at $x_0 \in X$. Show that $f * e_{x_0} \simeq_p f$ by *explicitly* writing down a path homotopy $H\colon I \times I \to X$ between $f * e_{x_0}$ and f.

2. §51 #1. Show that if $h, h'\colon X \to Y$ are homotopic and $k, k'\colon Y \to Z$ are homotopic, then $k \circ h$ and $k' \circ h'$ are homotopic.

3. §52 #4. Let $A \subset X$; suppose $r\colon X \to A$ is a continuous map such that $r(a) = a$ for each $a \in A$. (The map r is called a *retraction* of X onto A.) If $a_0 \in A$, show that $r_*\colon \pi_1(X, a_0) \to \pi_1(A, a_0)$ is surjective.