

Homotopy, Fundamental Groups, and Coverings

$M \simeq N$ means "M is homeo to N"

$M \simeq_H N$ means "M is homotopy equivalent to N"

RS2◊1. Prove that \mathbb{S}^n is not contractible.

RS2◊2. Is the following assertion true: if $M \setminus \{x\} \simeq N$, where N is contractible (i.e. $N \simeq_H \{n\}$), then M is not contractible?

RS2◊3. Is it true that $M \simeq N$ implies $M \simeq_H N$?

RS2◊4. Let K be the Klein bottle. Find $\pi_1(K)$.

RS2◊5. Let $T^2 = \mathbb{S}^1 \times \mathbb{S}^1$ be the torus. Find $\pi_1(T^2 \vee T^2)$.

RS2◊6. Find $\pi_1(\infty)$.