

**MATH 636 SPRING 2024
HOMEWORK 7
DUE MAY 20, 2024**

INSTRUCTOR: ROBERT LIPSHITZ

Required problems:

- (1) Hatcher 4.2.22 (p. 390).
- (2) The case $n > 1$ of Hatcher 4.2.23 (p. 390). (You can view the $n = 1$ case as an optional exercise.)
- (3) Hatcher 4.2.31 (p. 392). (You may assume the nullhomotopy of the inclusion $F \hookrightarrow E$ is constant on \tilde{x}_0 .)
- (4) Hatcher 4.2.32 (p. 392).

Optional problems:

Some good qual-level problems:

- Hatcher 4.2.28, 4.2.29, 4.2.34.
- Give a direct proof of exactness for the long exact sequence

$$\cdots \rightarrow \pi_n(F, \tilde{x}_0) \rightarrow \pi_n(E, \tilde{x}_0) \rightarrow \pi_n(B, x_0) \rightarrow \pi_{n-1}(F, \tilde{x}_0) \rightarrow \cdots$$

associated to a fibration $F \rightarrow E \rightarrow B$. (That is, don't use exactness of the long exact sequence for a pair.)

Email address: lipshitz@uoregon.edu