

MATH 431/531 FALL 2021
HOMEWORK 10
DUE DECEMBER 1, 2021.
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This is the last homework assignment of the course.

Problems:

- (1) Lee, Problem 5-3.
- (2) Lee, Problem 5-9. It's fine to just prove this for finite CW complexes, i.e., CW complexes built from finitely many cells. *Hint:* first prove the following lemma: If X is a locally path connected space and Y is obtained from X by attaching a single n -cell then Y is locally path connected. Then use the inductive construction of CW complexes.
- (3) Describe a CW complex homeomorphic to:
 - (a) S^1 (the unit circle in $\mathbb{R}^2$).
 - (b) $S^1 \times S^1$.
 - (c) $S^1 \times S^1 \times S^1$.
 - (d) $S^1 \times S^2$.
 - (e) The Möbius band.(Here, by *describe* I mean say how many cells there are of each dimension, and what their characteristic maps are. Or, if you prefer, how you build the CW complex inductively in terms of attaching maps.) In at least one case, prove your characteristic maps have all the required properties, if you used characteristic maps, or prove that your CW complex is homeomorphic to the specified space, if you used attaching maps.

Challenge problems (required for Math 531, optional for 431):

- (4) Lee, Problem 5-12.
- (5) Lee, Problem 5-13.

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