

MAT 215A HW06

Submit your **typeset** solutions to Gradescope by 9:00 pm on the Thursday when this problem set is due; see the class calendar for due dates.

Exercises pulled directly from Hatcher are based on the online version of the book linked to from the course website.

I will secretly choose two of these problems to be graded for accuracy. The remainder will be graded for completion.

1. Let X be the space obtained by gluing two Mobius bands together along their S^1 boundaries. Compute $\pi_1(X)$.
2. Let X be path-connected, locally path-connected space with finite $\pi_1(X, x_0)$. Show that any map $f : X \rightarrow S^1$ is nullhomotopic.

Hint: First prove that there is a lift $\tilde{f} : X \rightarrow \mathbb{R}$.

3. HE 1.3.8

Hint: Use lifting properties. You may use the result of HE 0.11 if you'd like, but it is not necessary.

4. HE 1.3.15

You do not need to show that $p : \tilde{A} \rightarrow A$ is a covering space.