Math 525: Takehome Midterm 2

Due date: In class on Wednesday, November 11.

Disclaimer, Terms, and Conditions: You may not discuss the exam with anyone except myself. You may *only* consult the following:

- The beloved(?) text, Hatcher's *Algebraic Topology*.
- Your class notes and returned HW sets.
- My online class notes and HW solutions.
- McClearly, *A first course in topology*, available at
  `http://math.vassar.edu/faculty/McCleary/Topos.html`.
- An abstract algebra text of your choice.

You can use any result in Hatcher in chapters 0-2.1, even if I didn't cover it in class. You can also use the result of any HW problem that was assigned, whether or not you did it. While I believe all the questions are stated correctly, please contact me if you think something is fishy.
Office hours: While I will not provide direct help on the exam problems, I will still be happy to answer questions about the course material during my usual office hours.

1. Hatcher, Section 2.1, #17.

2. Hatcher, Section 2.1, #26.

   Hint: Show that $H_1(X, A)$ is countable, but $\widetilde{H}_1(X/A)$ is not. For the later, follow the outline for showing that $\pi_1(X/A)$ has uncountable abelianization given on page 49 as Example 1.25. However, don't directly use the fact that $H_1(X/A)$ is the abelianization of $\pi_1(X/A)$.

3. Hatcher, Section 2.1, #22.

4. Hatcher, Section 2.1, #28.