

Math 572  
Spring 10  
Take-home final  
Faculty: R. Kaufmann

Name:

Signature:

Student ID Number:

**Directions:** Please send a pdf (scan) file to [rkaufman@math.purdue.edu](mailto:rkaufman@math.purdue.edu) with a cc to [kaufmann.ralph@gmail.com](mailto:kaufmann.ralph@gmail.com) by Monday 05/03 12:20 pm.

There are two parts. General questions and exercises from the book.  
Please do both parts!

Use this page as a cover page.

### Review questions

**Problem 1:** a) Give the axioms of a homology theory. b) How are they related to the axioms of a cohomology theory.

**Problem 2:** Are the chain groups of singular and simplicial chains free? If so give a basis.

**Problem 3:** Prove that the singular homology groups are functorial.

**Problem 4:** Give a sketch of the proof that for a triangulable space the singular and simplicial homology are isomorphic.

**Problem 5:** How is the chain complex of a CW complex defined. Give the chain groups and a definition of the differential. Also, are the chain groups free? If so give a basis.

### Exercises from Munkres

§41: 2

§42: 2 (in Example 2 check that  $z^1$  and  $d^1$  are cocycles and the calculation that they are cohomologous, in Example 4 check that the coboundary of  $(e_1^* + \cdots + e_9^*)$  is  $2\sigma^*$ )

§44: 3

§47: 1,3 (you do not need to give the simplicial cocycles), 7