

FINAL EXAM

DUE 5:00 PM WEDNESDAY, DECEMBER 13

- Do *any six* of the following nine problems. If you do more than six, only the first six will count.
- Please start each problem on a new page, and staple them together in numerical order.
- You may use the text and your own notes, but do not consult any other books or talk with anyone but me about the problems.
- You may use without proof any result stated in Chapters 1–10 or the Appendix of the text, or in any problems that were assigned (but not optional).
- If you need to define maps, paths, or homotopies in spaces that you can draw (such as specific subspaces of \mathbb{R}^2 or \mathbb{R}^3), it is sufficient to give clear and precise descriptions in words and pictures. You don't have to write down formulas, as long as your words and pictures are sufficiently clear and unambiguous to allow someone to write down a formula if necessary.

1. Problem 4-6.
2. Problem 5-5.
3. Problems 7-5 and 7-11.
4. Problem 9-8.
5. Problem 10-7.
6. Problem 10-11.
7. Problem 10-12.
8. Problem 10-17.
9. Assignment #8, Supplementary problem B. [In part (a), change “manifold” to “2-manifold.”]