

HOMEWORK 1 DUE JANUARY 19TH BY 5PM

Please remember to write down your name and your Stanford ID number (9 digits). All pages refer to Hatcher's book. You may use any results in the book up to and including section 1.1.

1. (6 marks) Exercise 10, page 19.
2. (8 marks) Show that the cardinality of the set of path components is a homotopy invariant.
3. (12 marks) Exercise 5, page 38. Fun fact: This exercise essentially shows that a space is simply-connected if and only if it has no 'holes'.
4. (8 marks) Exercise 13, page 39. Note that whenever Hatcher talks about homotopy of paths he means homotopy relative the endpoints, so the statement actually says "...iff every path in X with endpoints in A is homotopic rel endpoints to a path in A ."
5. (2+3+4+4+4+4 marks) Exercise 16, page 39.
6. (5 marks) For spaces X and Y with basepoints x_0 and y_0 , let $\langle X, Y \rangle$ denote the set of basepoint-preserving homotopy classes of basepoint-preserving maps $X \rightarrow Y$. Show that a basepoint-preserving homotopy equivalence $(X, x_0) \simeq (X', x'_0)$ induces a bijection between $\langle X, Y \rangle$ and $\langle X', Y \rangle$.