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Topology 1.1 : Homotopy (Animation Included) 1. History of Algebraic Topology; Homotopy Equivalence - Pierre Albin ~~SLS 2015-05 Allen Hatcher~~ AlgTop0: Introduction to Algebraic Topology Algebra, Geometry, and Topology: What's The Difference? Algebraic Topology Urdu Hindi MTH477 LECTURE 02 Algebraic Topology Introduction (Peter May) ~~Hatcher Algebraic Topology Solutions~~

HATCHER'S ALGEBRAIC TOPOLOGY SOLUTIONS REID MONROE HARRIS Van Kampen's Theorem Problem 1. Suppose G and H are nontrivial groups. Suppose $x = g_1 h_1 \dots g_n h_n$ lies in the center of $G \times H$, where $g_i \in G$ and $h_i \in H$. For any $g \in G$, we have $g g_1 h_1 \dots g_n h_n g^{-1} = g_1 h_1 \dots g_n h_n$. The only way for this to be true for all g is if $h_i = 1$ for all i .

~~Van Kampen's Theorem~~

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Also available are some additional exercises. The Exercises: I have not written up solutions to the exercises. The main reason for this is that the book is used as a textbook at a number of universities where the problem sets count for part of a student's grade.

~~Algebraic Topology Book - Cornell University~~

We may assume the polynomial is of the form $p(z) = z^n + a_1 z^{n-1} + \dots + a_n$. If $p(z)$ has no roots in \mathbb{C} , then for each real number $r \neq 0$ the formula $f_r(s) = p(re^{2\pi i s})/p(r)$ defines a loop in the unit circle $S^1 \subset \mathbb{C}$ based at 1. As r varies, f_r is a homotopy of loops based at 1.

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$f_1(x)$ and $G(x,1) = F(x,0) = f_0(x)$, i.e. a homotopy between f_1 and f_0 . Thus, the relation of homotopy among maps between two fixed spaces is reflexive, symmetric, and transitive, the latter by lemma 1, i.e. an equivalence relation. (c). Let $f_0: X \rightarrow Y$ be a homotopy equivalence with homotopy inverse g .

~~Allen Hatcher: Algebraic Topology~~

Solutions to Homework # 2 Hatcher, Chap. 0, Problem 16.1 Let $R_1 := M_n(\mathbb{R})$, $R_2 := M_n(\mathbb{C})$. We define a topology on R_1 by declaring a set $S \subset R_1$ closed if and only if, for each finite dimensional subspace $R_n = \{(x_k) \in R_1; x_k = 0; k > n\}$, $S \cap R_n$ is closed in the Euclidean topology of R_n . For each $x \in R_1$ set $j \sim x := \{(x_k) \in R_1; x_k = x_k \text{ for } k \leq j, x_k = 0 \text{ for } k > j\}$.

~~Solutions to Homework # 1 Hatcher, Chap. 0, Problem 4.~~

Algebraic Topology. This book, published in 2002, is a beginning graduate-level textbook on algebraic topology from a fairly classical point of view. To find out more or to download it in electronic form, follow this link to the download page.

~~Allen Hatcher's Homepage - Cornell University~~

Solutions Exam algebraic topology 1, 1-23-2019. Always motivate your answers and state the theorems/results you are using. Unless stated otherwise all homology is taken with integer coefficients. Question 1 a. For a pair of spaces $(X; Y)$ define $Z = (Y \times [0,1]) \cup X$ where $(y;1) \sim y$ and $(y;0) \sim (y;0)$ for all $y \in Y$. Show that for all $n \in \mathbb{N}$ we have $H_n(Z) = H_n(Y)$.

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~~Solutions Exam algebraic topology 1, 1-23-2019~~

By Lemma 1.15 (Hatcher), every loop in X based at x_0 is homotopic to a product of loops, where each loop is either contained in e or A . Since $n \geq 2$, a loop contained in e is nullhomotopic, so every loop in X is homotopic to a loop in A . Thus if $[f] \in \pi_1(X; x_0)$, there is a loop f_0 in A such that $[f_0] = [f]$. We have $f_0 \sim f$, so $[f_0] = [f] = [f_0] = [f]$.

~~Homework 3 MTH 869 Algebraic Topology~~

Let $f \in \pi_1(X, x_0)$. Let $E = \text{Int}(e_n)$ and consider $f \in \pi_1(E)$. This is an open subset of $(0, 1)$, so it is the union of a possibly infinite collection of subsets of $(0, 1)$ of the form (a_i, b_i) . Let $x \in E$ and let U be an open ball around x in e_n .

~~Exercise 1.1.18 in Hatcher's Algebraic Topology ...~~

Allen Hatcher: Algebraic Topology ALLEN HATCHER: ALGEBRAIC TOPOLOGY MORTEN POULSEN All references are to the 2002 printed edition Chapter 0 Ex 02 Define $H: (\mathbb{R}^n \setminus \{0\}) \times \mathbb{I} \rightarrow \mathbb{R}^n \setminus \{0\}$ by $H(x,t) = (1-t)x + t \frac{x}{\|x\|}$. Sketches of solutions to selected exercises Hatcher 2116 a) This could be done directly but let's use the exact sequence First,

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As we shall show in Theorem 2.44, the Euler characteristic of a cell complex depends only on its homotopy type, so the fact that the house with two rooms has the homotopy type of a point implies that its Euler characteristic must be 1, no matter how it is represented as a cell complex. Example 0.3.

~~Allen Hatcher - Purdue University~~

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Algebraic topology seeks to capture the "essence" of a topological space in terms of various algebraic and combinatorial objects. We will construct three such gadgets: the fundamental group, homology groups, and the cohomology ring. We will apply these to prove various

~~Math 215a Home Page~~

For if $[g(d_1)] = [z_1]$ and $[g(d_2)] = [z_2]$ in H_1 then $[g(d_1 + d_2)] = [z_1 + z_2]$, so that $[g(d_1 + d_2)]$ is given by $a(d_1 + d_2) = a(d_1) + a(d_2)$, and hence $[g(d_1 + d_2)] = [z_1 + z_2]$. The proof that the sequence of homology groups is exact proceeds in three stages. (a) $H_0 = \mathbb{Z}$. Certainly since $g \circ \partial = 0$ implies 0 . Conversely if $[z] \in \text{Ker } g$ then $g(z) = a(e)$ for some $e \in E$.

~~ALGEBRAIC TOPOLOGY - School of Mathematics~~

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