



ÜBUNGSBLATT 11

**Some more facts about coverings**

*To hand in by Friday, January 30, 2015, 12:00*

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**Exercise 1.** (20 points)

Let  $p_1 : C_1 \rightarrow B_1$  and  $p_2 : C_2 \rightarrow B_2$  be two coverings. Show that their product  $p_1 \times p_2$  gives a covering of the product space:  $p_1 \times p_2 : C_1 \times C_2 \rightarrow B_1 \times B_2$ .

**Exercise 2.** (20 points)

Let  $X$  be a compact manifold of positive curvature. Show that every map  $f : X \rightarrow S^1$  is homotopic to a constant map.

*Hints:* Use what you know about the fundamental group of  $X$  and the universal covering of  $S^1$ .

**Exercise 3.** (20 points)

Let  $X$  be a topological space. A path-connected subset  $U \subset X$  is called semi-simply connected, if every loop in  $U$  is nullhomotopic in  $X$ .

Let  $p : C \rightarrow B$  be a covering,  $B$  path-connected und locally path-connected and  $U \subset B$  semi-simply connected. Show that the covering restricted to  $U$  is trivial.