

DIFFERENTIAL TOPOLOGY
PROBLEM SHEET 9

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Problem 1 (10 points, covering map). Let $f \in C^\infty(M, N)$ be a covering map between smooth manifolds. Show that f^* is injective on $\Omega^*(N)$. Is f^* injective on de Rham cohomology?

Problem 2 (10 points, Möbius strip). Compute the de Rham cohomology of the Möbius strip.

Problem 3 (10 points, projective space). Compute the de Rham cohomology of the n -dimensional real projective space.

Problem 4 (10 points, torus). Compute the de Rham cohomology of $S^1 \times S^1$.

Date: Please hand in before the lecture by **14th of April 2023**. For all exercises the results need to be proven using results from this lecture and the lectures before, provided you give a reference.