Prof. Hansjörg Geiges
Tilman Becker, M.Sc.
Dr. Rima Chatterjee

SS 2022

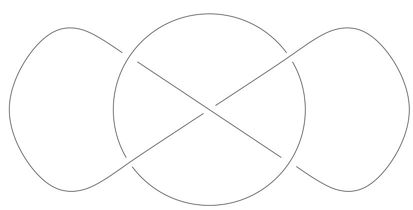
Geometrische Topologie

Übungsblatt 10

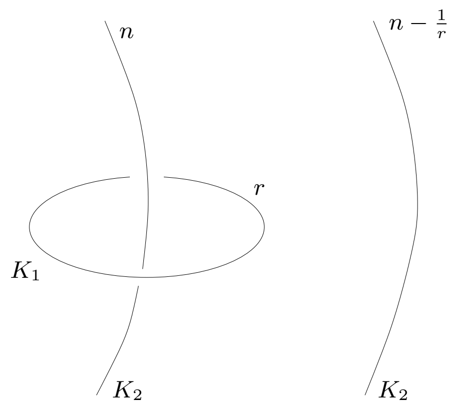
Aufgabe 1. Show that surgery along a knot $K \subset S^3$ with surgery coefficient $r \in \mathbb{Q}$ yields the same 3-manifold up to diffeomorphism as surgery along the mirror image of K with coefficient $-r$.

Aufgabe 2. (a) Verify that the linking number of the two unknots shown below is 0.

(b) Compute the Jones polynomial of this link in order to show that the two unknots link nontrivially.



Aufgabe 3. Show that the following two surgery diagrams (with $n \in \mathbb{Z}$ and $r \in \mathbb{Q} \cup \{\infty\}$) are equivalent:



To do so, proceed as follows. Let M be the manifold obtained from S^3 by surgery along K_2 only. Let T be the solid torus glued in to carry out this surgery. Show that K_1 is isotopic in M to the soul $S^1 \times \{0\} \subset S^1 \times D^2$ of this solid torus T (here you need that $n \in \mathbb{Z}$). Thus, the further surgery along K_1 is equivalent to cutting out T and regluing it. It remains to show that this new regluing corresponds to the coefficient $n - 1/r$. For this you need to work out what the meridian and parallel of K_1 in M are, expressed in terms of meridian and longitude of T.

Abgabe: Mittwoch 22.6.22
bis spätestens 17:00 Uhr im Raum 206/7 des MI