

Exercise sheet 13: the Alexander polynomial

1. Calculate the Alexander polynomial for the knot from Exercise 1, sheet 12.
2. Calculate the Alexander polynomial for the knot from Exercise 3, sheet 12.
3. Let K be an oriented knot. Prove the following properties of the Alexander polynomial:
 - (a) $\Delta_{rK}(t) = \Delta_K(t)$
 - (b) $\Delta_{\overline{K}}(t) = \Delta_K(t)$

And note that the Alexander polynomial is in this sense much weaker than the Jones polynomial which can detect mirror images.

4. Find a formula to calculate the Alexander polynomial for the connected sum of two knots $K_1 \# K_2$.
5. Prove the following statement: Suppose that K is a knot of genus $g(K)$, then the maximum degree of t in the Alexander polynomial cannot exceed $g(K)$.
6. Compute the Alexander polynomial of the figure eight knot using the skein relation.
7. Use the skein relation to prove that

$$\Delta_K(1) = 1$$

for every knot K .

Due Date: 03.06.2019