# HOMEWORK 1

**Problem 1.** Prove that there are no knots with crossing numbers 1 and 2.

**Problem 2.** Show that the know $4_1$ (with an arbitrary chosen orientation) is equivalent to both its reverse and to its reflection. (Note: the *reverse* of an oriented knot is the same knot with the orientation reversed. The *reflection* of a knot is its mirror image).

**Problem 3.** Identify the following knots in the table of knots:
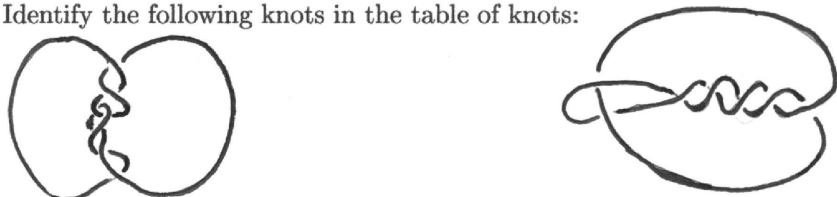


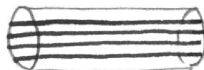**Problem 4.** Find the Reidemeister moves transforming the first knot into the second one:
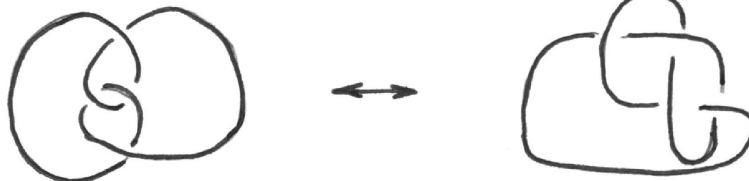


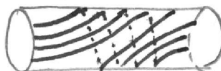**Problem 5.** Find the Reidemeister moves transforming the first link into the second one:



**Problem 6.** (Torus links) *Torus links* are produced in the following way:

- Choose a pair of integers $p, q$ with $p > 0$;
- Take a cylinder together with $p$ strings running parallel to its axis:



- Twist the cylinder through $q/p$ full twists (the direction of the twist is determined by the sign of $q$);



- Glue the ends of the cylinder to form a torus:



- The resulting link is called $T_{p,q}$. (It is formed from the strands drawn on the surface of the torus).

Identify $T_{2,3}$ and $T_{2,5}$ in the table. Then try to identify $T_{3,4}$ as well.

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