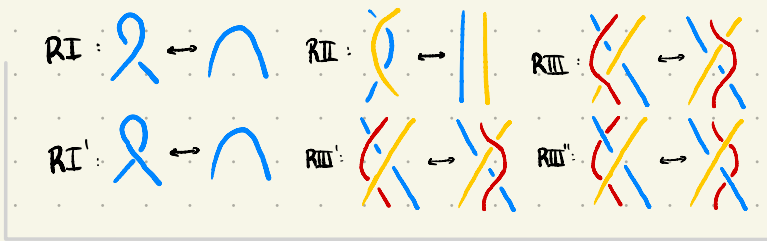


0-1: The unknot and Reidemeister moves.



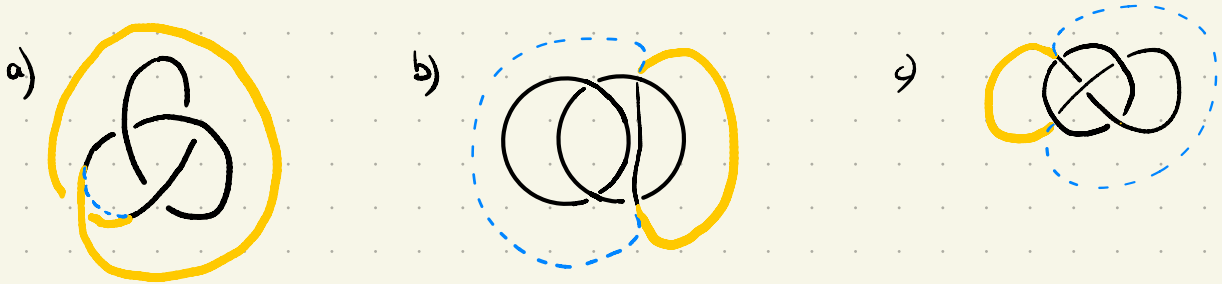
0. Find:

- a) A link diagram for the unknot with 100 crossings.
- b) A link diagram with n components and $2(n-1)$ crossings. (The link must be connected, e.g. \textcircled{C} doesn't count)
 $(n \geq 2)$
- c) A link with three components such that removing any one component yields two separate unknots: $\bigcirc \bigcirc \bigcirc$

1. Simplify the following diagrams until obtaining the unknot, indicating each Reidemeister move.



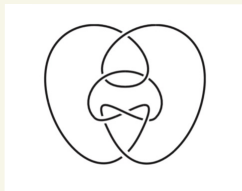
2. In the following link diagrams, perform Reidemeister moves until moving the orange strand in bold to the dashed blue strand.



3. The move you performed in 2 is called a macro-move. A macro-move is a move of the form



simplify the knot from the poll



into a simpler knot.

4. Classify:


- a) All links with exactly two components and at most 4 crossings
- b) All knots with exactly 3 crossings (don't count crossings that can be undone, e.g. ∞ doesn't count)
- c) All knots with exactly 4 crossings (don't count crossings that can be undone, e.g. ∞ doesn't count)
Hint: use macro-moves to show the figure-eight knot and its mirror image are topologically equivalent.

5. Prove that the Reidemeister move R_{III} follows from the moves R_{II} and R_{II} .

(Much harder)

6. a) Can you show that the links you obtained in 4.a) are not topologically equivalent?

b) Can you show that the knots you obtained in 4.b) are not topologically equivalent to the unknot?

c) Can you show that the link you obtained in 1.c) is not topologically equivalent to ?

d) Can you distinguish the trefoil and its mirror image?

e) Can you show that the figure-eight knot isn't secretly the unknot?