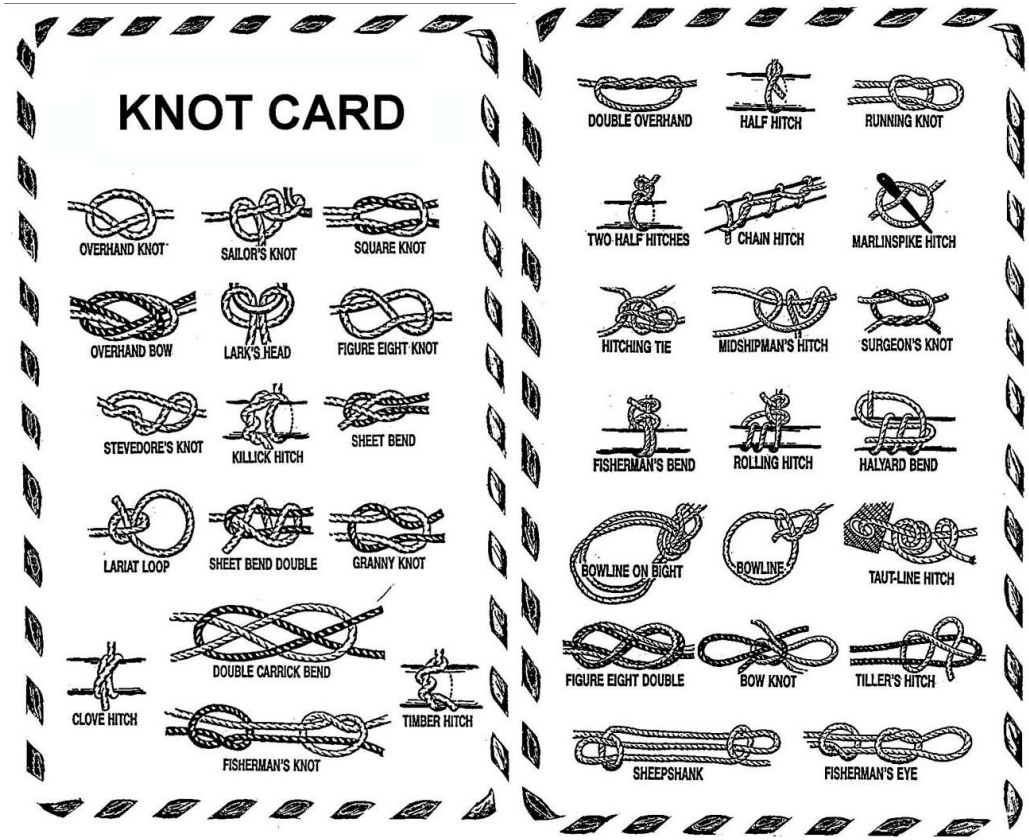
MINT Sommer 2023

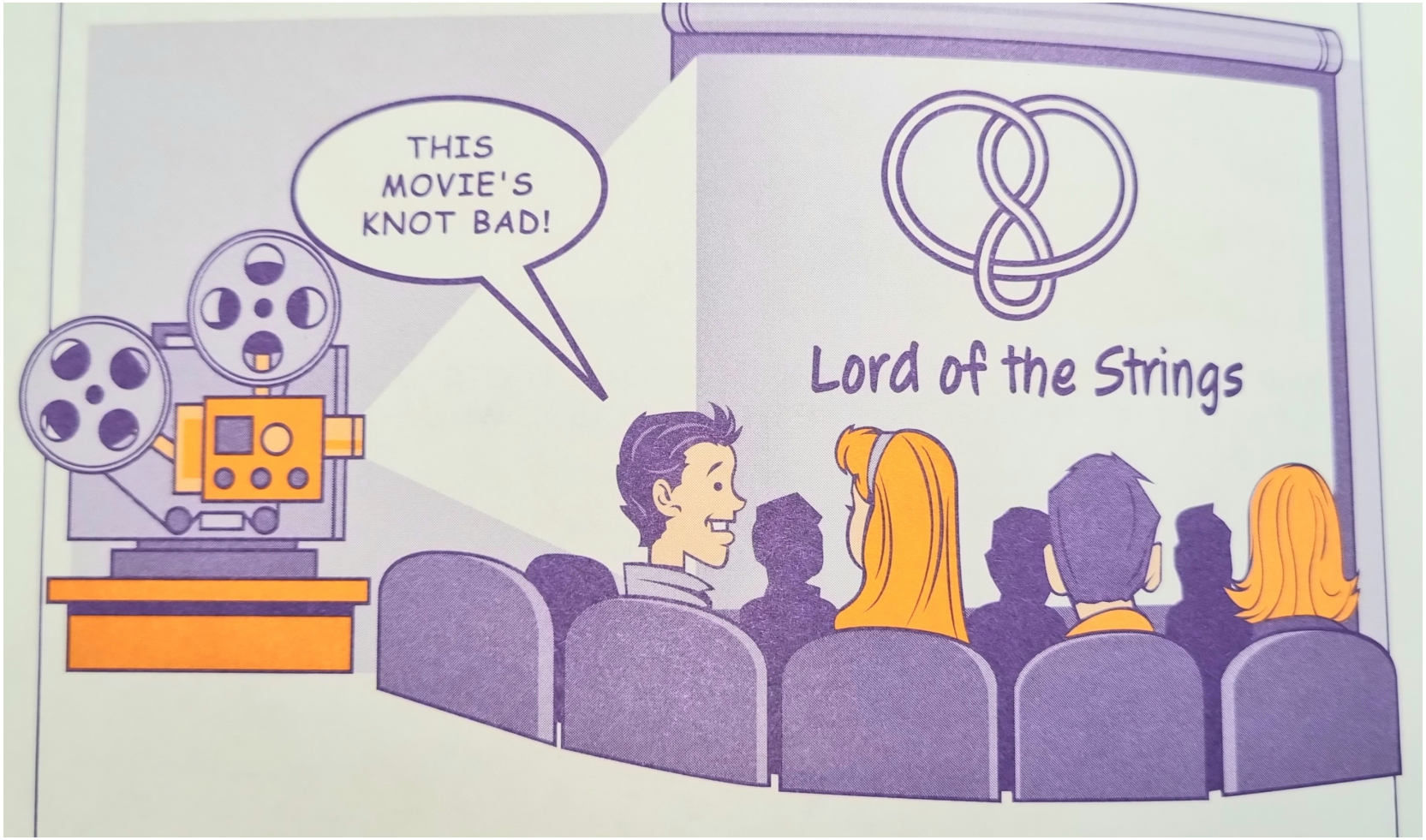
Jason Uhing

27.06.2023

Was sind Knoten?

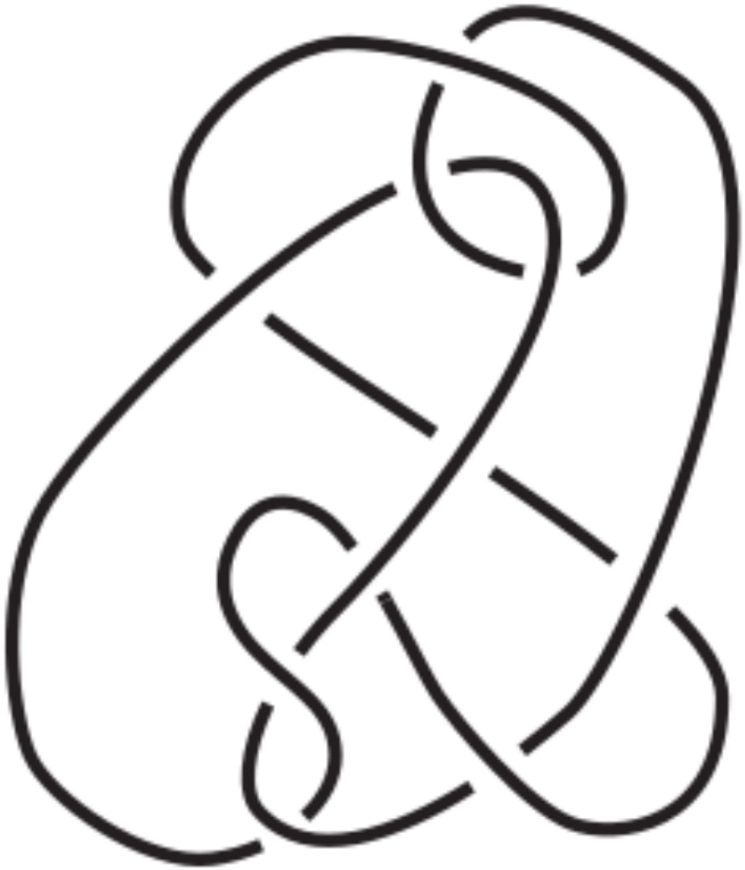


Projektionen von Knoten



Schattenspiele

The Culprit (der/die Übeltäter*in)



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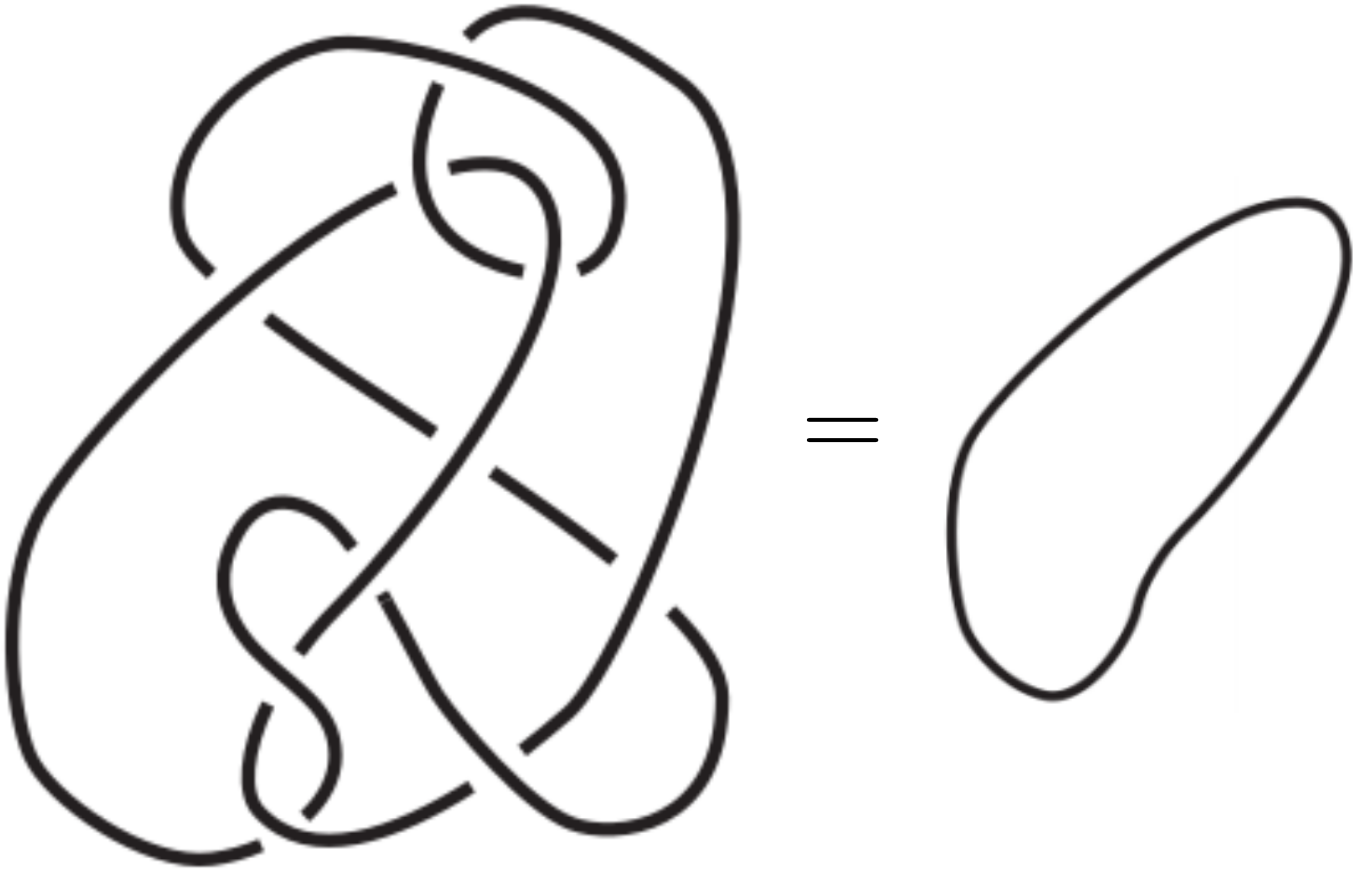


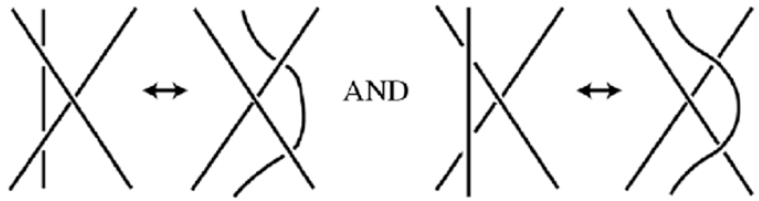
Reidemeisterbewegungen

Satz (Reidemeister 1932)

Diagramme gleicher Knoten lassen sich durch Reidemeister-Bewegungen ineinander überführen:

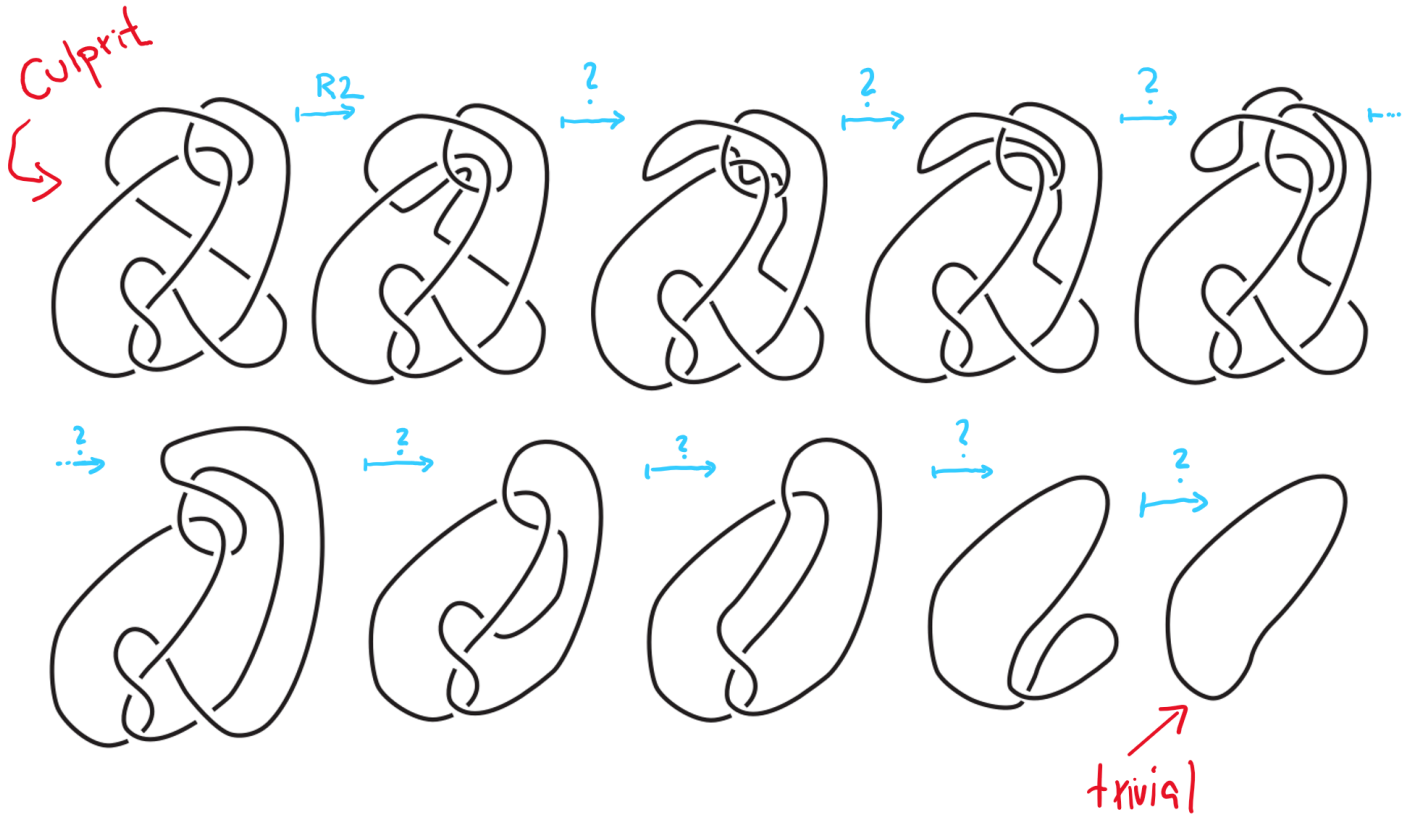
Type I

Type II

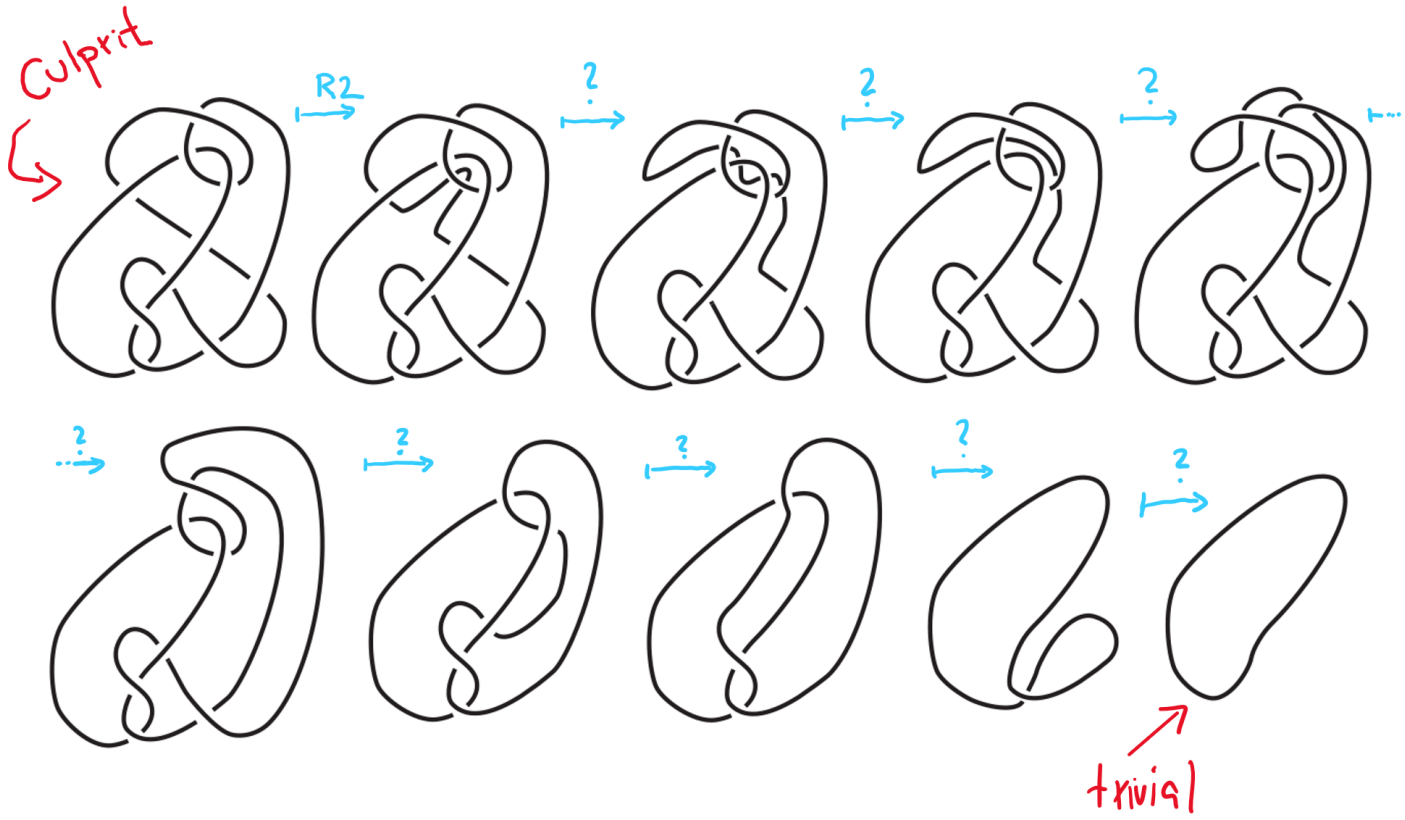


Type III

Reidemeisterbewegungen



Reidemeisterbewegungen



Knoteninvarianten



Knoteninvarianten

KnotInfo: Table of Knots

About | Database Download | KnotFinder | LinkInfo | More | Please Cite KnotInfo

Basic Search | Enter a knot | Advanced search | Clear All

Check the desired boxes in the sections below and then click SUBMIT to produce your desired table.

Submit

knotinfo.math.indiana.edu

Select knots by crossing number Submit

☑ 3-6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11a ☐ 11n ☐ 12a ☐ 12n ☐ All

Nomenclature Submit

☑ Name ☐ Name Rank ☐ PD Notation ☐ DT Name ☐ DT Notation ☐ DT Rank ☐ Conway Name ☐ Conway Notation ☐ Gauss Notation ☐ Tetrahedral Census Name

3D Presentations and Properties Submit

☐ Adequate ☐ Almost Alternating ☐ Alternating ☐ Boundary Slopes ☐ Braid Notation ☐ Fibered ☐ Monodromy ☐ Montesinos Notation ☐ Pretzel Notation ☐ Quasialternating ☐ Seifert Matrix ☐ Small or Large ☐ Symmetry Type ☐ Two-Bridge Notation

3D Numeric Invariants Submit

☐ Arc Index ☐ Braid Index ☐ Braid Length ☐ Bridge Index ☐ Clasp Number ☐ Crosscap Number ☐ Crossing Number ☐ Determinant ☐ Genus-3D ☐ Mosaic/Tile-Number ☐ Morse-Novikov Number ☐ Nakanishi Index ☐ Stick Number ☐ Super Bridge Index ☐ Thurston-Bennequin Number ☐ Torsion Numbers ☐ Tunnel Number ☐ Turaev Genus ☐ Unknotting Number ☐ Unknotting Number-Algebraic ☐ Width

Positivity and Strong Quasipositivity Submit

☐ Positive Braid ☐ Pos. Braid Notation ☐ Positive ☐ Pos. PD Notation ☐ SQ-Positive ☐ SQ-Postive Braid ☐ Q-Positive ☐ Q-Positive Braid

4D Numeric Invariants smooth unless indicated algebraic (Alg.) or topological (Top.) Submit

☐ Arf Invariant ☐ Clasp Number-4D ☐ Crosscap Number-4D ☐ Crosscap Number-4D (Top.) ☐ Concordance Order ☐ Concordance Order (Alg.) ☐ Concordance Order (Top.) ☐ Concordance Genus ☐ Concordance Genus (Top.) ☐ Double Slice Genus ☐ Genus-4D (Top.) ☐ Signature ☐ Signature function

Polynomial Invariants Submit

☐ Alexander ☐ A-Polynomial ☐ Conway ☐ HOMFLY ☑ Jones ☐ Kauffman

Vectorized Polynomial Invariants (click to view)

Knot Homology Properties and Numeric Invariants Submit

☐ Epsilon ☐ L-space ☐ Nu ☐ Ozsvath-Szabo *tau* ☐ Rasmussen *s*

Knot Homology Polynomial Invariants Submit

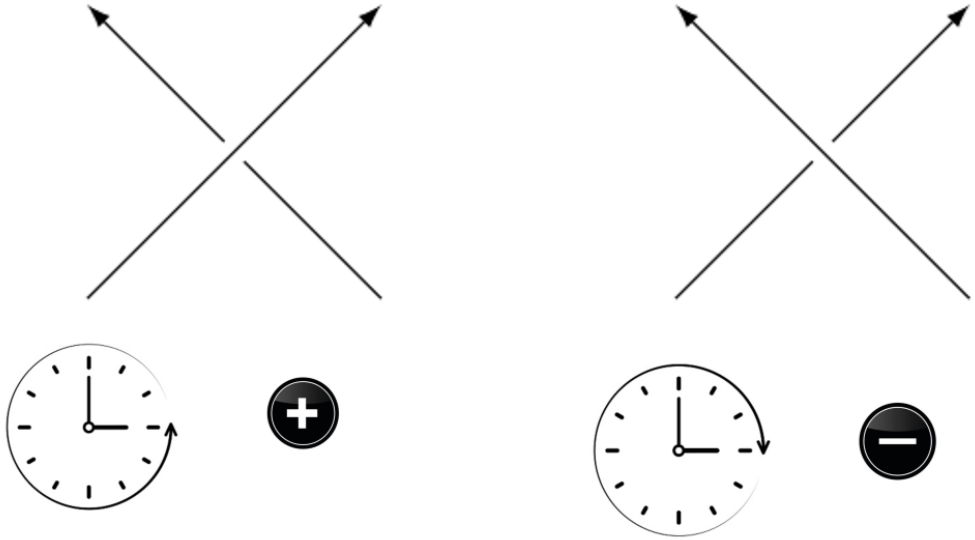
☐ KH Unred Z Poly ☐ KH Odd Red Z Poly ☐ KH Red Z Poly ☐ KH Odd Red Q Poly ☐ KH Red Q Poly ☐ KH Odd Red Mod2 Poly ☐ KH Red Mod2 Poly ☐ HFK Polynomial

Vectorized Knot Homology Polynomial Invariants (click to view)

Hyperbolic Invariants Submit

☐ Chern-Simons Invariant ☐ Full Symmetry Group ☐ Longitude Length ☐ Longitude Translation ☐ Meridian Length ☐ Meridinal Translation ☐ Max. Cusp Volume ☐ Volume

Vorbereitung I: Verdrillung



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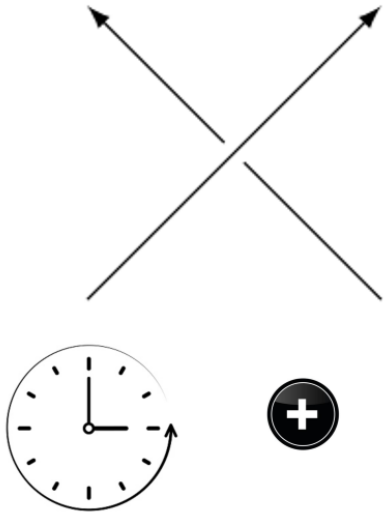

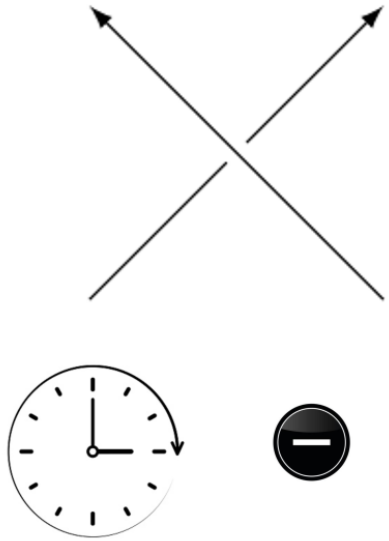

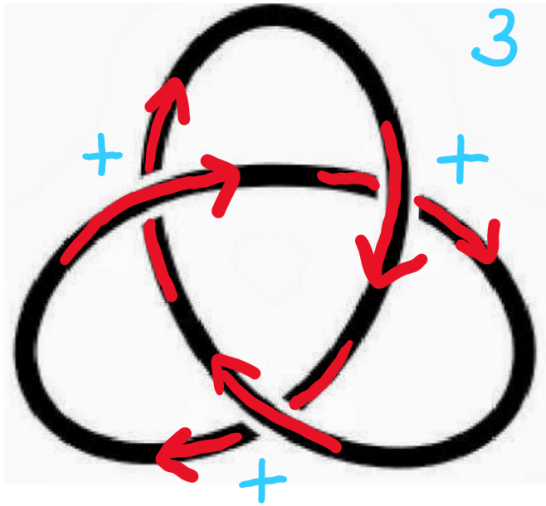

Vorbereitung II: Polynome

$\mapsto$

$\mapsto$ 37.54 €

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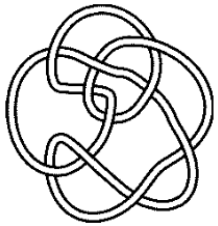
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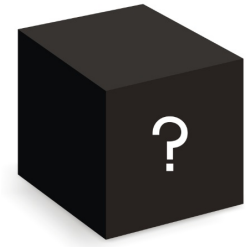

$\mapsto$ Polynom

Kauffman-Invariante

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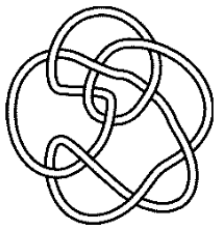
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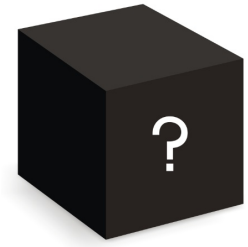

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Kauffman-Invariante

$$x^2 + 3x, \quad 2x^5 - x^4, \quad x^{-2} = \frac{1}{x^2}$$

Vorbereitung II: Polynome


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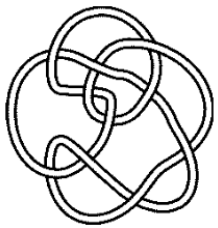
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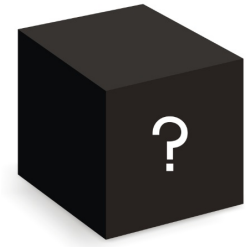

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Vorbereitung II: Polynome


$\mapsto$

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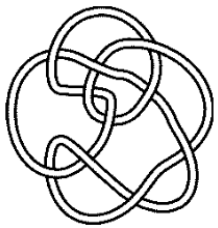
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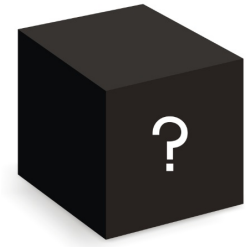

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$$A \cdot A^2 = A^3, \quad A \cdot A^{-1} = 1, \quad A^{-2} \cdot A = A^{-1}$$

Klammerpolynom (von Kauffman)

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Regel 1: $\langle \bigcirc \rangle = 1$

Regel 2:
$$\begin{cases} \langle \times \rangle = A\langle \rangle\langle \rangle + A^{-1}\langle) (\rangle \\ \langle \times \rangle = A\langle) (\rangle + A^{-1}\langle \rangle\langle \rangle \end{cases}$$

Regel 3: $\langle L \cup \bigcirc \rangle = (-A^2 - A^{-2})\langle L \rangle$

Kleeblattknoten I

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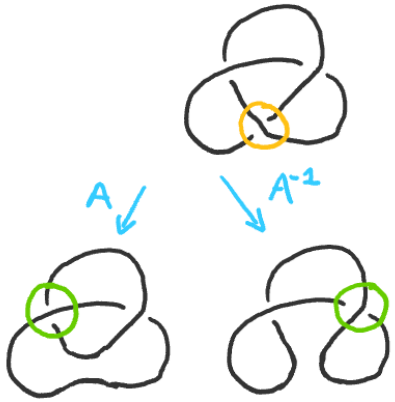

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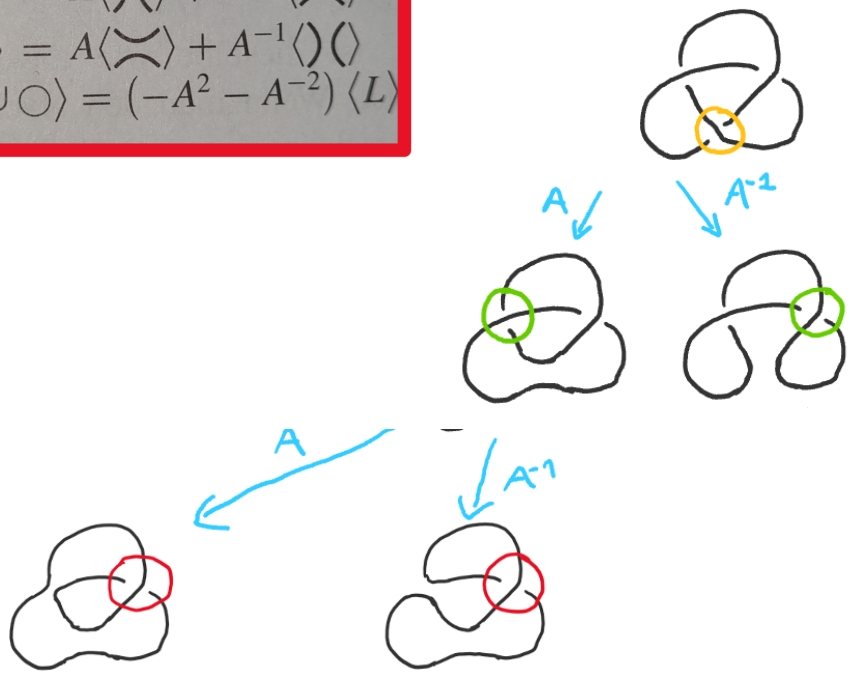

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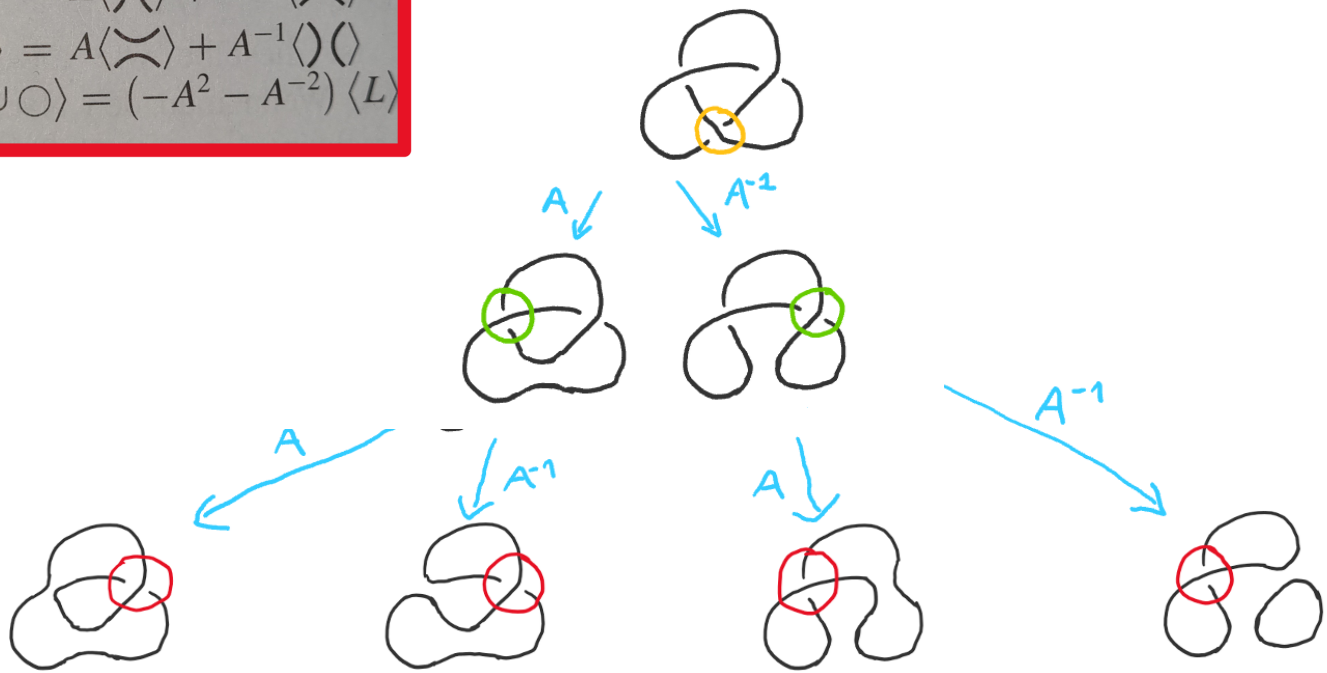

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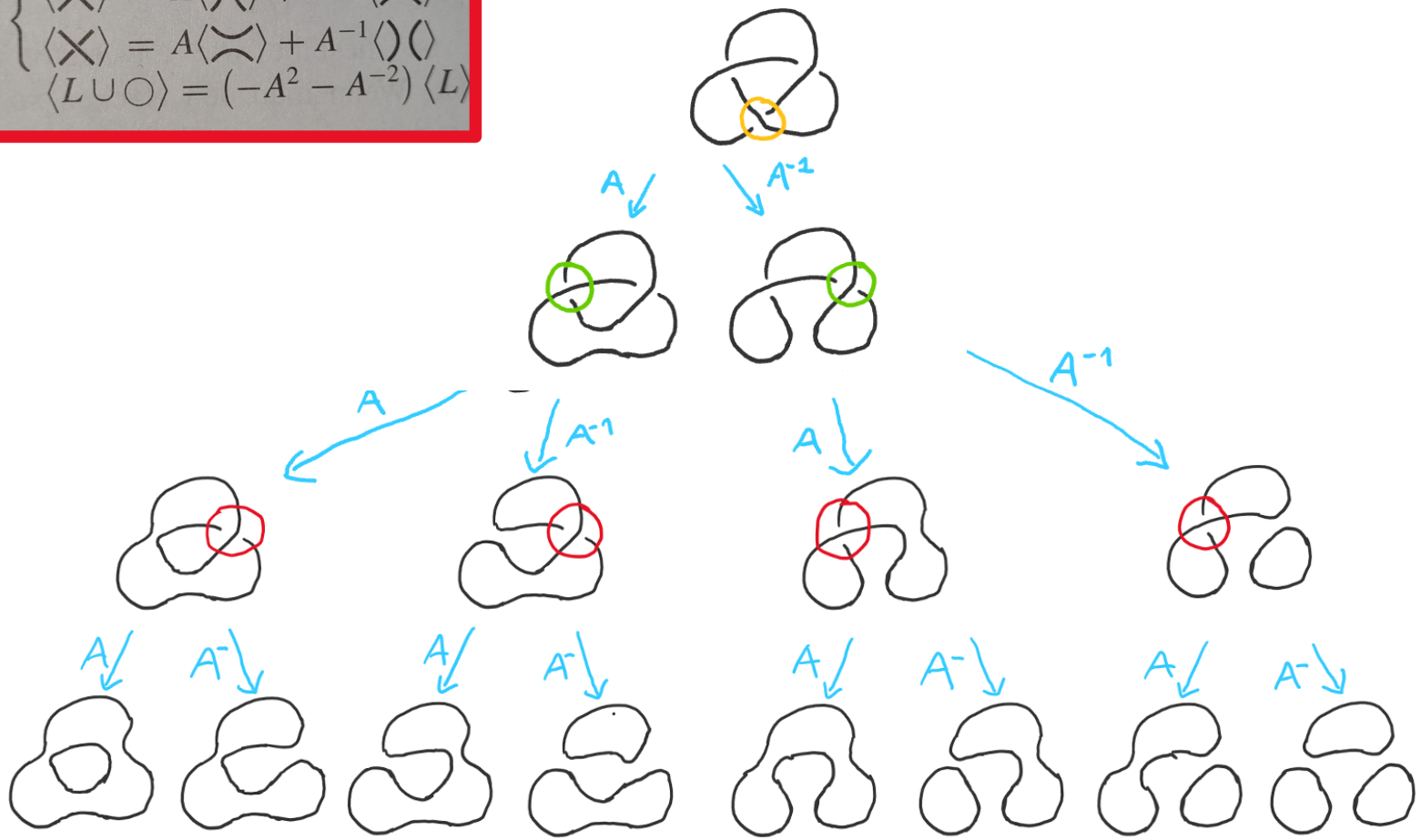

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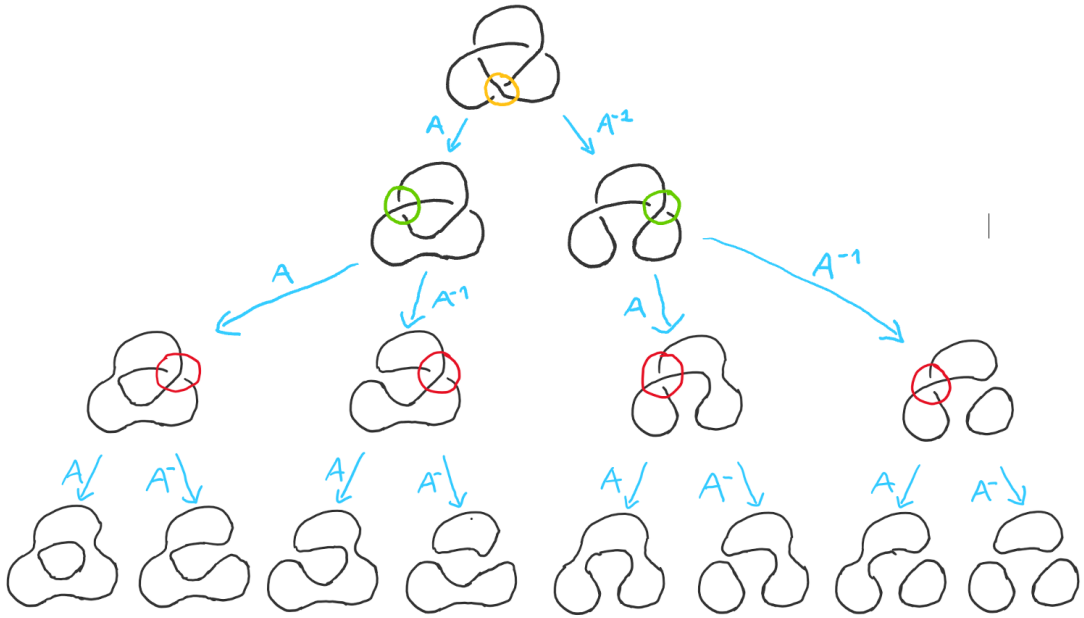

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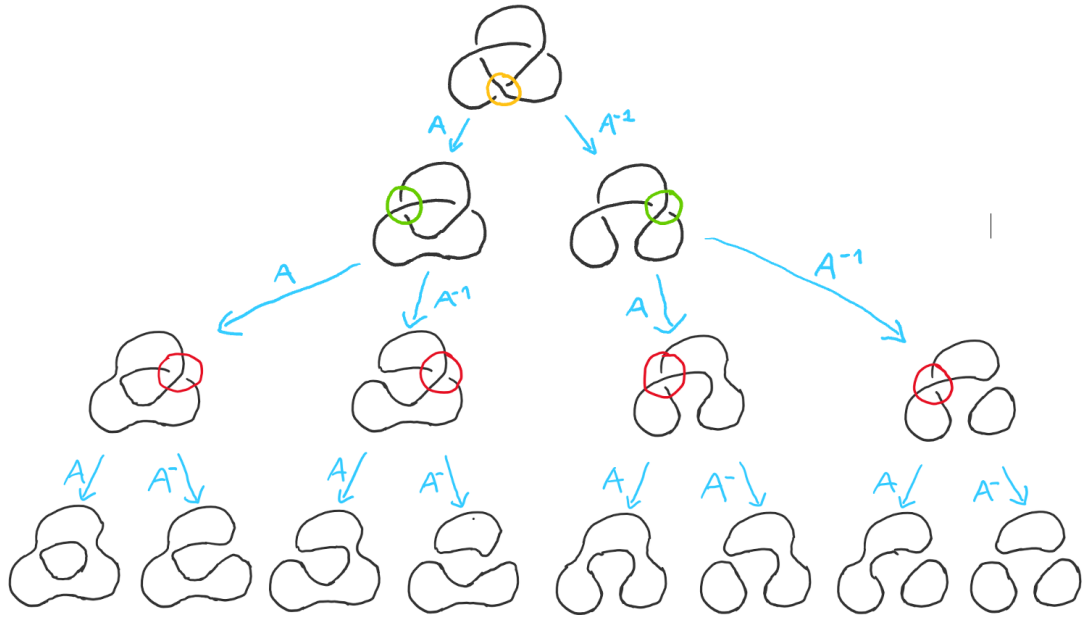

1. $A \cdot A \cdot A \cdot \left(-A^2 - A^{-2}\right) = A^3\left(-A^2 - A^{-2}\right) = -A^5 - A$

Kleeblattknoten II

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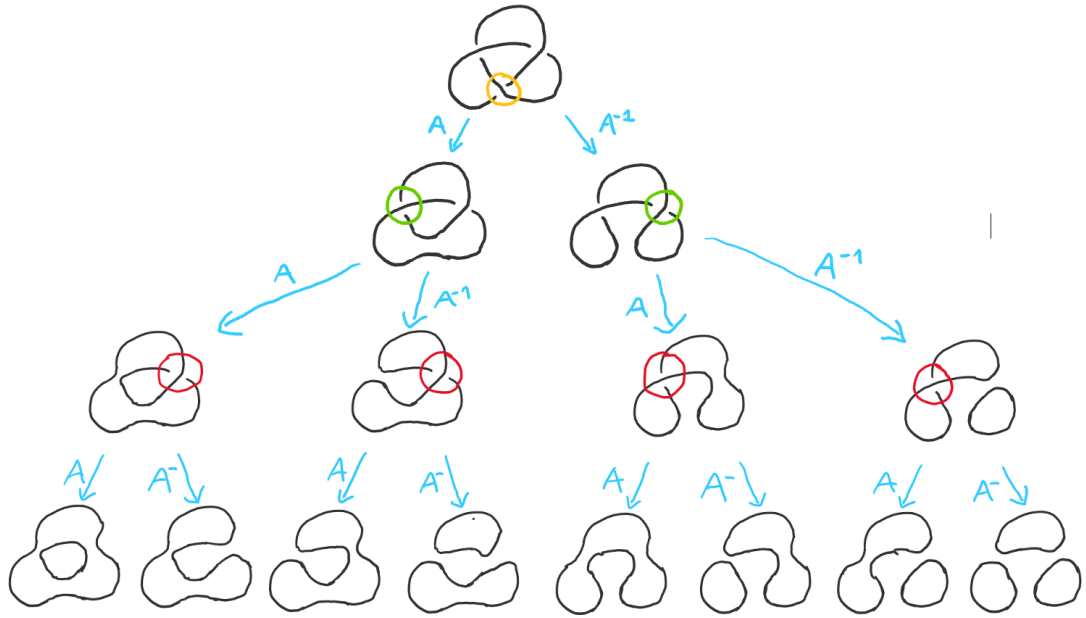

1. $A \cdot A \cdot A \cdot \left(-A^2 - A^{-2}\right) = A^3\left(-A^2 - A^{-2}\right) = -A^5 - A$
2. $A \cdot A \cdot A^{-1} \cdot 1 = A$

Kleeblattknoten II

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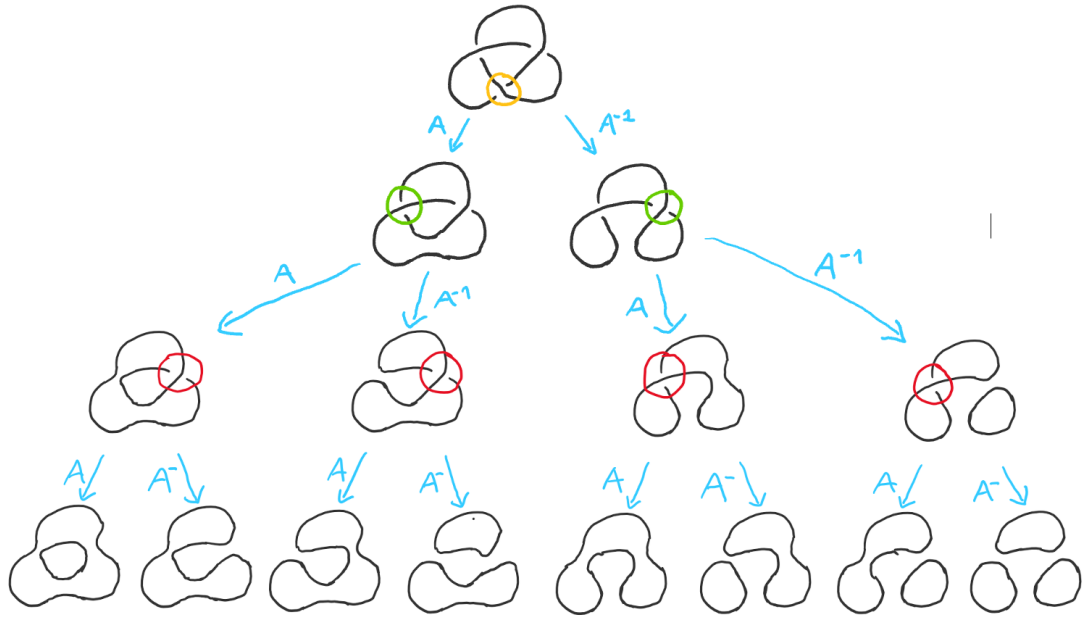

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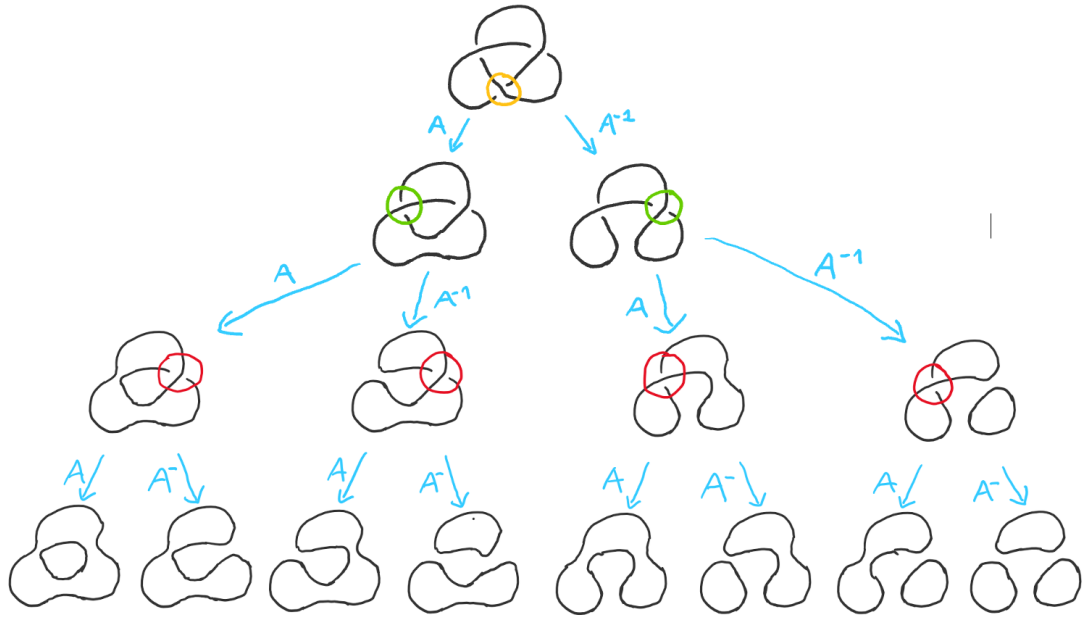

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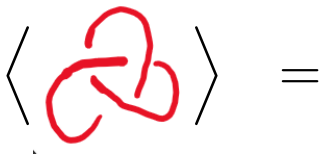
⋮

8. $A^{-1} \cdot A^{-1} \cdot A^{-1} \cdot \left(-A^2 - A^{-2}\right)^2 = A + 2A^{-3} + A^{-7}$

Kleeblattknoten III



Kleeblattknoten III

$$\left\langle \right\rangle = (-A)^{(-3)\cdot \text{Verdrillung des Diagramms}}$$

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$$\left\langle \quad \right\rangle = (-A)^{(-3)\cdot \text{Verdrillung des Diagramms}} \cdot \Big(\text{Summe } \textcircled{1} \text{ bis } \textcircled{8}\Big)$$

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$$= (-A)^{(-3)\cdot 3}\left(A^{-7} - A^{-3} - A^{5}\right)$$

$$= -A^{-16} + A^{-12} + A^{-4}$$

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$$\left\langle \quad \right\rangle = 1$$

$$\quad \neq \quad$$

Knoten mit gleichem Klammerpolynom

Kinoshita-Terasaka

Conway

Offene Frage seit etwa 40 Jahren....

Problem

Finde einen nicht-trivialen Knoten K mit $\langle K \rangle = 1$.