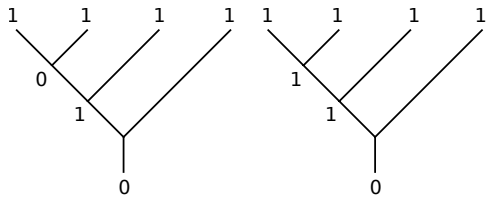
Exercise 1) Universality of Fibonacci Anyons

As seen in the lecture, a qubit can be encoded by four Fibonacci anyons with trivial total charge using the states

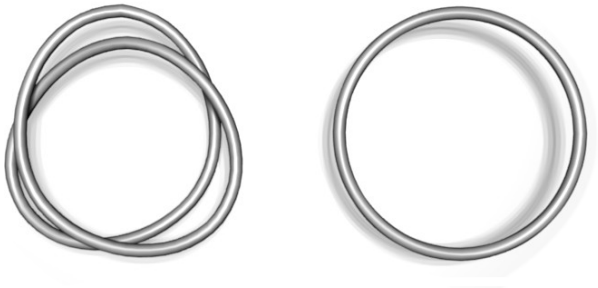


As calculated in exercise 2a) of problem set 11, the R- and the F-matrix in this basis are given by $R = \begin{pmatrix} \exp(4\pi i/5) & 0 \\ 0 & -\exp(2\pi i/5) \end{pmatrix}$ and $F = \begin{pmatrix} \tau & \sqrt{\tau} \\ \sqrt{\tau} & -\tau \end{pmatrix}$, where $\tau = \frac{\sqrt{5}-1}{2}$.

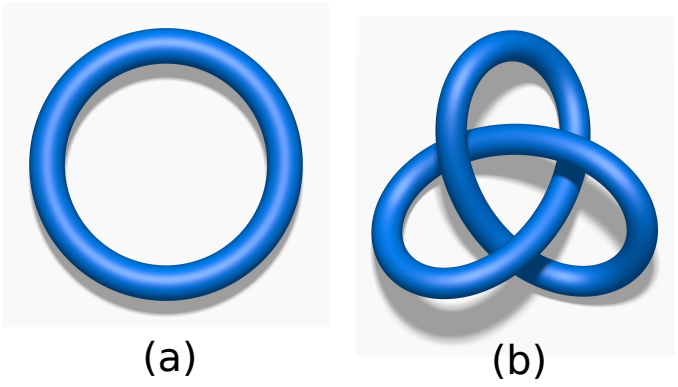
Show that the R- and the F-matrix can be used to approximate any single unitary operation to arbitrary accuracy.

Exercise 2) Knot Theory

A knot is a closed non-intersecting curve in $\mathbb{R}^3$ an two knots are equivalent if they can be continuously deformed into each other:



(i) Consider the unknot (a) and the trefoil knot (b). Discuss if these two knots are equivalent.



(ii) Can you imagine any algebraic method to decide (i)?