# The Jones polynomial

Both the writhe and the bracket polynomial are useful, but they have a big flaw! It's possible to draw the same knot in different ways, but have the writhe and bracket polynomial change.

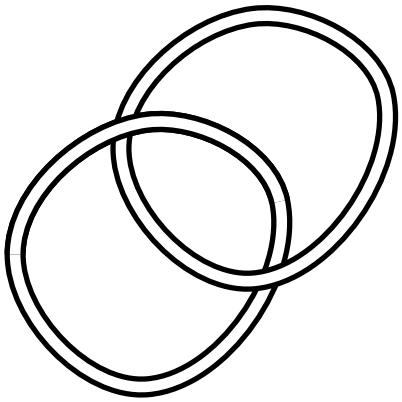
Fortunately, if we are cunning, we can combine them and cancel this problem out. This gives the **Jones polynomial**.

The Jones polynomial is

$$V(\text{link}) = (-A^3)^{-w(\text{link})}\langle \text{link} \rangle.$$

Here $w(\text{link})$ is the writhe of the link we are considering.

For example, consider the "Hopf link".



We now know that the bracket polynomial of this is:

$$-A^4 - A^{-4}.$$

The writhe will be $+2$ or $-2$, depending on which orientation we choose. Let's suppose we get $+2$. So we get

$$\begin{aligned} V &= (-A^3)^{-2}\big(-A^4 - A^{-4}\big) \\ &= A^{-6}\big(-A^4 - A^{-4}\big) = -A^{-2} - A^{-10}. \end{aligned}$$

Using your previous work, can you find the Jones polynomials of the following knots?