Exercise 1 (Adams Exercise 6.14). Compute the Alexander polynomial of the figure-eight knot by hand. Use SnapPy to verify your answer.

Exercise 2 (Adams Exercise 6.25). Suppose that $K$ is an alternating knot with odd crossing number. Prove that $K$ is not amphichiral.

Exercise 3. For an arbitrary link $L$, the Jones polynomial $V(L)$ is a polynomial in $t^{1/2}$.

(a) For a positive integer $n$, let $K_n$ denote the $n$ component split unlink. Prove that $V(K_n) = t^{(n-1)/2}(-t^{-1} - 1)^{n-1}$.

(b) Use the skein relation to argue that if any two of $V(L_+)$, $V(L_-)$, and $V(L_0)$ are polynomials in $t$, then the third is a polynomial in $t$ as well. (Note: Being a polynomial in $t$ is a stronger condition than being a polynomial in $t^{1/2}$.)

(c) Use part (b) and an analysis of the parities of the number of components of $L_+, L_-$, and $L_0$ in order to argue that any link $L$ with an odd number of components has $V(L)$ a polynomial in $t$.

Exercise 4. Prove that for any link $L$, $V(L)(-1) = \Delta(L)(-1)$, i.e., that the evaluations of the Jones and Alexander polynomials at $-1$ are equal. This number is called the determinant of $L$, $\det(L)$.

Exercise 5. For any link $L$, prove that $\det(L) = \det(L^*)$, where $L^*$ is the mirror image of $L$.

Exercise 6. Compute the Jones polynomial of

![Link Diagram](image)

by hand. Use SnapPy to verify your answer.

Exercise 7. Use your answer to the previous exercise, known computations of the Jones polynomial of the trefoil and figure eight knots, and the fact $V(L_1 \# L_2) = V(L_1) \cdot V(L_2)$ to prove that the following two links have identical Jones polynomials.

*Date: 27.IV.15.*
Bonus: Prove that the two links are nonisotopic.

Exercise 8. Use SnapPy to check that the following two knots have the same Jones polynomial.

Bonus: Prove that two knots are nonisotopic.

Exercise 9 (Bonus). If $L$ is a link in SnapPy, then $L.determinant()$ determines the determinant of $L$. Find the first nontrivial knot with determinant $\pm 1$. (The answer is pretty far out in the Rolfsen knot table. I highly recommend learning enough sage to automatically iterate through the table.)