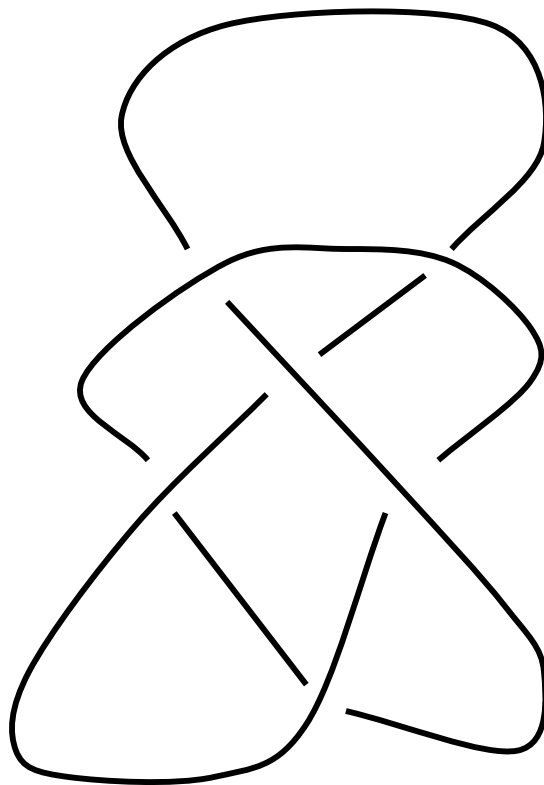




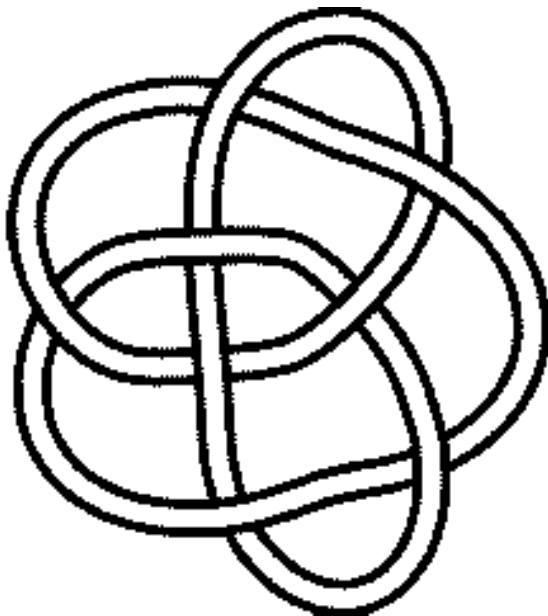
4. (a) (3 points) The crossing number of a knot  $K$  is ...

(b) (6 points) Find the crossing number of the following knot. Explain your reasoning.



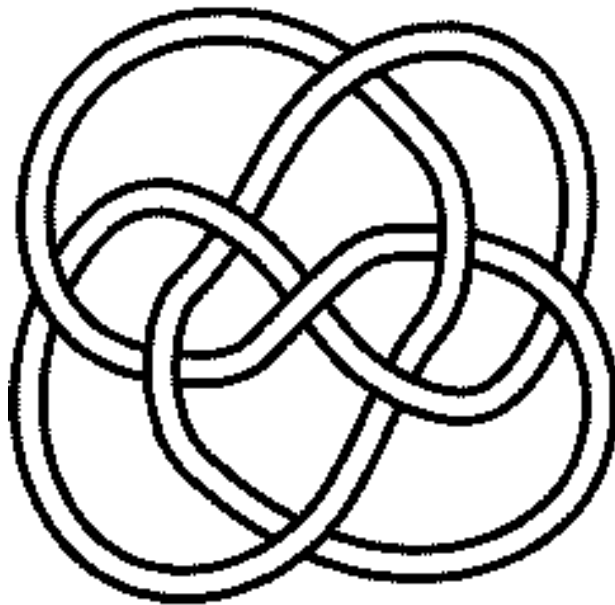
5. (a) (3 points) The unknotting number of a knot  $K$  is ...

(b) (6 points) Find the unknotting number of the following knot. Explain your answer.



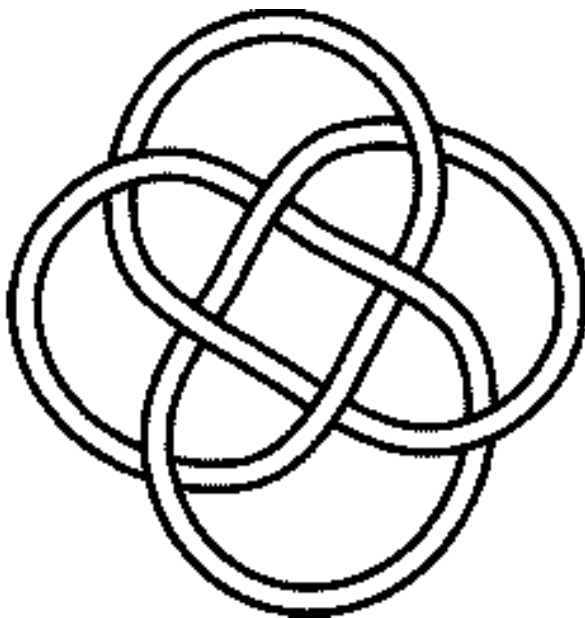
6. (a) (3 points) Explain what it means for a knot  $K$  to be 11-colorable.

(b) (6 points) Is the following knot 11-colorable? If so, find an 11-coloring. Explain your reasoning.



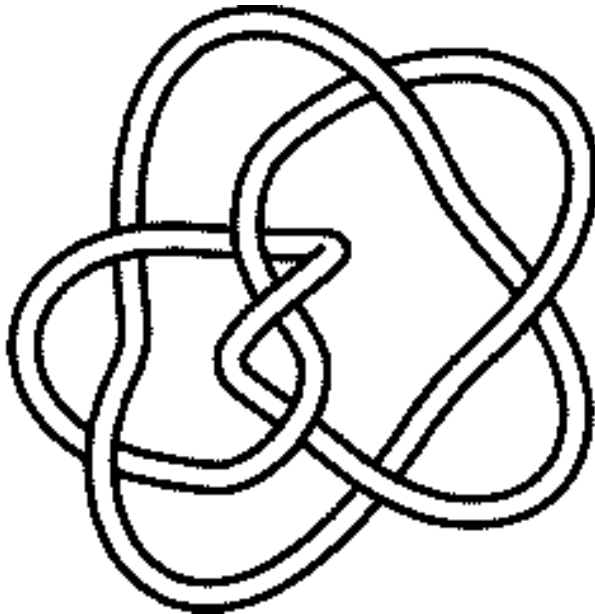
7. (a) (3 points) Explain how to find the Dowker notation of a knot  $K$ .

(b) (6 points) Find one Dowker notation of the following knot. Explain your work.



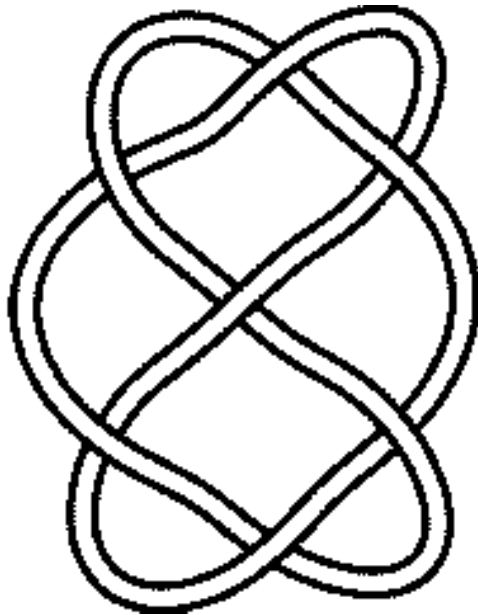
8. (a) (3 points) A knot is rational if ...

(b) (6 points) Find the Conway notation of the following knot. Is the knot rational?



9. (a) (3 points) The bridge number of a knot  $K$  is ...

(b) (6 points) Find the bridge number of the following knot. Explain your reasoning.



10. (5 points) Let  $K$  be a knot. The Alexander polynomial,  $\Delta(K)$  of the knot  $K$  is a polynomial with positive and negative integer exponents which is an invariant of the knot. There are two rules that are used to find the Alexander polynomial of a knot  $K$ . They are:

(a)  $\Delta(\text{unknot}) =$

(b)

where  $L_+$  is

$L_-$  is

and  $L_0$  is

11. (4 points) Draw your knot.

12. (4 points) What is your favorite invariant and why?

13. (4 points) Find your favorite invariant (your answer above) for your knot.