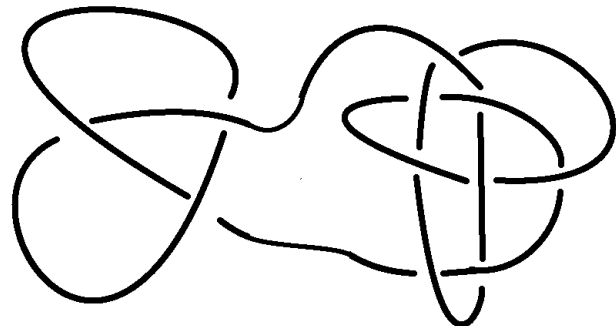# TMath 342

Show all your work. Reasonable supporting work must be shown to earn credit.

1. [9] TRUE or FALSE: If the statement is *always* true, mark it as true, otherwise, mark
   the statement as false. Either way give a brief explanation for your answer.

   (a) (HW1 9.11) There is a knot with a crossing number of one.

   (b) (HW2 9.7) The knot $3_1 \# 8_{17}$ (shown below) is equivalent to the unknot.

   (c) (ChemicalSymmetryActivity) A chemical that is chemically chiral is necessarily
   geometrically chiral.

2. [3] (ConnectSum Activity #5) Find a knot U such that for any knot K, that $K \# U$ is equivalent to K. Justify yourself.

3. [6] (Invariants Activity #2) Determine if the knot whose projection is below is tricolorable. If it is, tricolor it. If not, justify yourself.
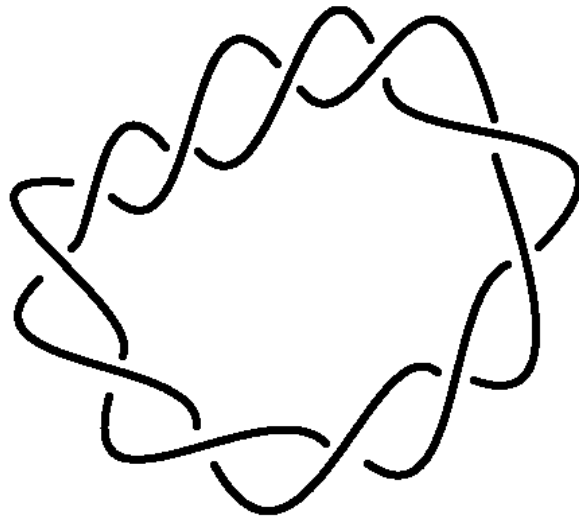
4. [4] (12.7) An object can fail to be a Topological Rubber Glove in multiple ways. Describe two ways that an object can fail to be a Topological Rubber Glove.

5. [4] (HW1 9.9) Restrict yourself to one Reidemeister move at a time to show the knot below is equivalent to the unknot.
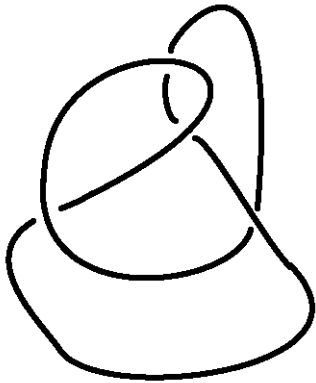
6. [4] (Lecture 4/11) Explain how the Reidemeister moves are relevant/powerful beyond showing equivalency between two given knots.

7. Consider the molecule on the right for the following questions.

(a) [1] (ChemMirror Activity #4)
Indicate what sections (if any)
of the molecule are in front of the paper,

(b) [1] (ChemMirror Activity #4)
Indicate what sections (if any)
of the molecule are in back of the paper,

(c) [4] (12.2) Determine if the molecule is
geometrically chiral in its current configuration.
Explain your reasoning.
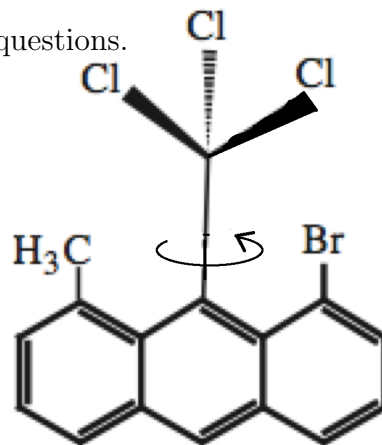
(d) [4] (12.2) Determine if the molecule is chemically chiral or not. Explain your reasoning.

(e) [2] (12.2) Determine if the molecule is topologically chiral or not. Explain your reasoning.

(f) [3] Determine if the molecule is a Euclidean Rubber Glove or not. Explain your reasoning.