

# Homework 7

Math 139

**DUE: Thursday April 6, 2007.**

Reference: Knots and Links Chapters 4 and 7.

1. If you haven't done so already, please submit the unfinished homework questions. Namely, proving Brunnian links are nontrivial, proving rational knots are prime, proving the Kinoshita-Terasaka knot (Figure 4.12 page 98 Knots and Links) decomposes into two nontrivial 2-tangles.
2. (a) Question 1 of Chapter 7 exercises page 186 in Knots and Links.  
(b) In HW 6, you computed the Seifert matrix, determinant and signature of a knot with 5 or more crossings. Please compute the Alexander polynomial for this knot. Check your answer!
3. Let  $P$  be a pretzel knot with  $p$ ,  $q$  and  $r$  all odd.
  - (a) Find a Seifert matrix for  $P$ .
  - (b) Find a formula for the Alexander polynomial of  $P$ .
  - (c) Calculate the Conway polynomial for  $P$  using the skein relation.
4. Complete the proof of Proposition 7.4.3 (page 166 in Knots and Links), showing that there is a knot for any given Conway polynomial.
5. Question 9 of Chapter 7 exercises page 187 in Knots and Links.
6. Ask Gerardo to show you why the constant term of the Conway polynomial for a knot is always 1. The coefficients of the Conway polynomial also tell you something about a link  $L$ . Let  $a_0$  be the coefficients of 1. Then  $a_0(L)$  is 1 if  $L$  has one component and is 0 if  $L$  has more than 1 component. Can you prove this? What can you say about the coefficient of  $z$ ? (Hint: look at linking numbers.)