

# Math 3140: Homework 4

**Due: Wednesday, September 25**

A.

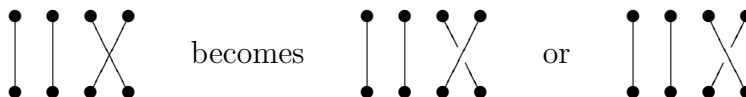
6.3. Show that the elements  $w \in S_9$  such that  $\{w(2), w(5), w(7)\} = \{2, 5, 7\}$  form a subgroup of  $S_9$ . What is the order of this subgroup?

6.7+. (a) Describe/characterize the elements of order 2 of  $S_n$ .

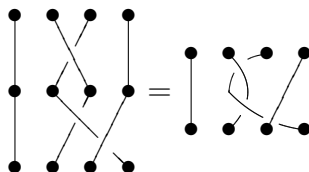
(b) Show that if  $n \geq 4$ , then every permutation can be written as a product of two permutations of order 2. Hint: Answer the question first for cyclic permutations.

(c) What goes wrong if  $n < 4$ ?

B. The *braid group*  $B_n$  is a group generated by the diagrams of  $S_n$  but we keep track of where strings cross. For example,



and we keep track of these crossings when multiplying,



What is the inverse of an element in  $B_n$ ? Show that  $B_n$  has infinite order. What are the elements of finite order in  $B_n$ ?

C. 6.6, 6.9