

Homework 7

Due: June 12th (Saturday), 11:59 pm

- Please submit your work on Blackboard.
 - You are required to submit your work as a single pdf.
 - Please make sure your handwriting is clear enough to read. Thanks.
 - No late work will be accepted.
 - There are five randomly picked questions (**5 pts for each**) that will be graded.
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- (1) Find the orders of each of these permutations.
 - (a) $(123)(2435)(132)$
 - (b) $(136)(278)(42537)$
- (2) Find the permutations that correspond to the rigid motions of a rectangle that is not a square. Do the same for the rigid motions of a rhombus (diamond) that is not a square.
- (3) Let the dihedral group D_n be given by elements a of order n and b of order 2, where $ba = a^{-1}b$. Show that $ba^m = a^{-m}b$, for all $m \in \mathbf{Z}$.
- (4) Find the order of each element of D_6 .
- (5) Let $\tau = (abc)$ and let σ be any permutation. Show that $\sigma\tau\sigma^{-1} = (\sigma(a)\sigma(b)\sigma(c))$.
- (6) In general, if $(12 \cdots k)$ is a cycle of length k and σ is any permutation, then show that
$$\sigma(12 \cdots k)\sigma^{-1} = (\sigma(1)\sigma(2) \cdots \sigma(k)).$$
- (7)
 - (a) In S_4 , find the subgroup H generated by (123) and (23) .
 - (b) For $\sigma = (234)$, find the subgroup $\sigma H \sigma^{-1}$. (Hint: Use (5) or (6) above)