

MAT 631 — HOMEWORK 9

DUE ON THURSDAY 31 OCTOBER 2013 🍁

1. Prove that a normal subgroup is a union of conjugacy classes. (Hint: If C is a conjugacy class and N is a normal subgroup, show that either $C \subseteq N$ or $C \cap N = \emptyset$.)
2. List all the partitions of 6. For each partition, give a representative of the corresponding conjugacy class of S_6 , and the size of the class.
3. Exhibit all Sylow 2- and Sylow 3-subgroups for D_{12} . (Hint for $p = 2$: recall that the center is $Z(D_{12}) = \langle \sigma^3 \rangle$, generated by an element of order 2. Hint for $p = 3$: they are cyclic.) In each case compute $n_p(D_{12})$ so you know you have the right number of subgroups.
4. Compute $n_3(S_4)$ and exhibit all Sylow 3-subgroups for S_4 .