March 1, 2021

18.702 Problem Set 3

due Wednesday, March 10

1. A finite group G operates on itself by conjugation. This operation produces a permutation representation ρ of G.

(a) Determine the character χ of ρ.

(b) Let the conjugacy classes in G be $C_1, ..., C_k$, and let χ' be another character. Write $\langle \chi, \chi' \rangle$ as a sum over the conjugacy classes.

(c) The decomposition of χ into irreducible characters can be determined easily by looking at the character table. of G. Explain this.

2. Chapter 10, Exc. M.4 *(elements in the center)*
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3. Chapter 11, Exc. 3.3 (b,e) *(kernels of some homomorphisms)*

4. Chapter 11, Exc. 3.9 *(unipotent and nilpotent elements)*