

## Math 211 - Bonus Exercise 7 (please discuss on Forum)

- 1) Calculate all the composition series of  $D_8$  and verify the Jordan-Hölder theorem for this group.
- 2) Calculate all the composition series of  $A_4$  and verify the Jordan-Hölder theorem for this group.
- 3) If  $G$  has a composition series and  $H \trianglelefteq G$  is a normal subgroup, prove that  $G$  has a composition series with  $H$  as one of the constituent groups.
- 4) Construct a (reasonable) action of the symmetric group  $S_n$  on the set of polynomials  $\mathbb{Z}[x_1, \dots, x_n]$ . Find an element  $P(x_1, \dots, x_n)$  of this set whose stabilizer is the alternating subgroup  $A_n$ .