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 $\mathbb{Z}[x_1, \ldots, x_n]$. Find an element $P(x_1, \ldots, x_n)$ of this set whose stabilizer is the alternating subgroup A_n.