

Math 817, Fall 2023, Dr. Honigs
Homework 4, Part 1
Due **Oct. 31** at the start of class

Instructions:

- You are encouraged to work in groups. However, write your solutions in your own words.
- In your solutions, list any names of people you have worked with. (This is practice for listing collaborators!)
- In your solutions, refrain from using language like “clear”, “obvious”, or “easy”.

Homework 4 Part 1 will be graded out of 50 points.

Textbook questions:

Aluffi Ch. IV

- 3.8, 3.13 (commutators)
- 3.9, 3.10 (p -groups and solvability, nilpotence)
- 3.15, 3.16 (applications of Sylow groups to solvability)
- 4.5, 4.11 (also prove the relevant statement from 4.10), 4.12 (the “with stamina” statement at the end is optional), 4.17

Remarks:

- 3.8/3.13 should be done together and count as one problem, worth 5 points. Recall that “characteristic” is defined in Ch. IV, Exercise 2.2.
- The other problems will be worth 5 points each, except for 3.16, which is worth 10 points.
- In Exercise 3.9, “construct explicitly” just means using these facts about the center. This exercise is somewhat of a warm-up for 3.10.
- Some hints on 3.15: What happens if one of the Sylow subgroups is normal?
- Regarding 3.16: You are encouraged to use results from the textbook and homework. Some of the results on non-simple groups are potentially very useful here.