

18.705 Commutative Algebra
Fall 2026

Problem Set #1

Due: 09/18/2026

These problems are related to material covered in Lectures 1–2.

Instructions: Solve problems 1 and 2 below, then complete the survey problem 3. Your answer should be in the form of a PDF submitted to [Gradescope](#) no later than midnight on the date due (do not ask for an extension, the answer is no). Be sure to include your name somewhere on the PDF. Each problem is worth 1 point and the grading is binary; unless otherwise specified, any credible attempt will be awarded 1 point.

I recommend using latex to create the PDF, but scanned handwritten solutions are fine provided your handwriting is legible. For the first two problems collaboration (including with LLMs) is permitted, but I strongly encourage you to first attempt the problems on your own; none of the problems are meant to be tricky and they all should have reasonably short solutions. Problem 3 (the survey1) should be answered entirely on your own.

Problem 1. Self-graded problems from Altman–Kleiman (1 point)

Read chapters 1 and 2 of [AK13](#) (this should all be review). Then solve the following 8 exercises in AK13 and check your answers against the solution (clicking the exercise number in the AK13 PDF will take you directly to the solution – don’t click until you are ready to see the answer). These problems all relate to topics covered in lecture or chapters 1 and 2 of AK13, but you may find it helpful to read the material preceding each exercise for some of the later problems.

2.18, 2.22, 2.23, 4.12, 10.24, 10.35, 15.8, 16.9

Do not include your answers in your Gradescope submission. Your answer to this problem should instead be a list of 8 positive integers, each counting the number of lines in the solution to the 8 problems above that is printed in AK13.

Problem 2. Maximal ideals and residue fields of the ring $\mathbb{Z}[x]$ (1 point)

Classify the maximal ideals of the ring $\mathbb{Z}[x]$ and their residue fields. Your classification needs to be rigorously justified; a correct answer without proof will receive 0 points.

Problem 3. Survey (1 point)

Answer the following:

1. How long did it take you to complete this problem set (include everything)?
2. Do you think the pace of the lectures this week was too slow, too fast, or just right?
3. Name one thing you liked and one thing you did not about this pset.
4. Name one thing you liked and one thing you did not about the lectures this week.