

MATH 4370: Computational Algebra

## Problem Set 2

*Due Wednesday, September 11, 2019*

You are allowed to work in groups, but the solutions you hand in should be written by you only.

If you did not receive a full score for a problem part you submitted, and would like to resubmit a new, corrected version, you can do so, within two weeks of the pset due date. Your final score on the pset will reflect the best score you received.

Instructions on how to hand in pset:

[https://gradescope-static-assets.s3-us-west-2.amazonaws.com/help/submitting\\_hw\\_guide.pdf](https://gradescope-static-assets.s3-us-west-2.amazonaws.com/help/submitting_hw_guide.pdf)

Cornell Libraries have free scanners, if needed:

<https://olinuris.library.cornell.edu/print-scan-wifi>

**Problem 1.** Let  $k$  be an infinite field and let  $f, g \in k[x_1, \dots, x_n]$ . Then  $f = g$  in  $k[x_1, \dots, x_n]$  if and only if  $f : k^n \rightarrow k$  and  $g : k^n \rightarrow k$  are the same function.

**Problem 2.** Let  $V$  and  $W$  be affine varieties in  $k^n$ . Then:

(1)  $V \subset W \Leftrightarrow \mathbf{I}(W) \subset \mathbf{I}(V)$

(2)  $V = W \Leftrightarrow \mathbf{I}(W) = \mathbf{I}(V)$

**Problem 3.** Given  $f_1, \dots, f_s, g_1, \dots, g_t \in k[x_1, \dots, x_n]$  such that  $\mathbf{V}(f_1, \dots, f_s) = \mathbf{V}(g_1, \dots, g_t)$ , is it true that  $\langle f_1, \dots, f_s \rangle = \langle g_1, \dots, g_t \rangle$ ? Prove or disprove.

**From §1.2 of your book:** [Exercises 8, 9, 11, 15](#)

**From §1.4 of your book:** [Exercises 2, 3, 6, 8, 15](#)