

**MATH 497 INTRODUCTION TO APPLIED ALGEBRAIC
GEOMETRY
HOMEWORK 3**

Assigned 8/28, due 9/4 in class.

Reading this week is page 49-81 in your book, Cox, Little, and O'Shea's *Ideals, Varieties, and Algorithms*. You should also go over the sage worksheet I will share with you. Note that due to some reordering of information in lecture, next week will also mostly be spent in these sections (Chapter 2, Sections 1-5).

Check out <https://www.youtube.com/watch?v=7aNaH-8n-TM> for some further information on drawing last week's problem 1, and how considering this surface helps us understand Simpson's Paradox.

Problem 1. Show that given a term order $<$ and an ideal $I \subset k[x_1, \dots, x_n]$, $in_{<}(I)$ is an ideal.

Problem 2. Find the initial ideal and a Gröbner basis of $\langle x^3y - z^2, wxyz - y^2z^2 \rangle \subset k[x, y, z, w]$.

Now in Cox, Little, and O'Shea, in Chapter 1 Section 5, do exercises 9, 10, 12.

In Chapter 2 Section 1, do exercises 1,3. In Chapter 2 Section 2, do exercises 1,5,11. Finally, in Chapter 2 Section 4, do exercise 4.