MATH 4370: Computational Algebra

Problem Set 3

Due Wednesday, September 18, 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

Cornell Libraries have free scanners, if needed:

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

Problem 1. Prove that the ideal $\langle x, y\rangle \subset \mathbb{C}[x, y]$ is not principal. Is the ideal $\langle x, x^5 - x^2 + 1, 102x^{1111}, x^2 - ix\rangle \subset \mathbb{C}[x]$ principal?

Problem 2. Show that lex is a monomial ordering.

Problem 3. Show that ordering monomials of $k[x_1, x_2]$ according to their total degree, that is, $x^\alpha > x^\beta$ if and only if $|\alpha| > |\beta|$, is not a monomial ordering. What property of monomial orderings fails?

From §1.5 of your book: Exercise 12

From §2.2 of your book: Exercises 1(b), 3 (for 1(b)), 11