

Computer Algebra (2012)-Aalborg University

Lecture 19, November 9th

19th Lecture: Friday November 9th, 8:15-12:00 at room G5-109.

- 8:15-10:00 Lecture: Monomial ideals and Hilbert's basis theorem, Gröbner bases and S-polynomials, Buchberger algorithm (pages 591–600).
- 10:00-12:00 Work in groups. Exercises from [GG]: A, B, C, D, 21.21, 21.23, 21.17, E, 21.9 (only i).

Exercise A: Let $R = \mathbb{F}_3[X, Y]$. Let $f = X^2Y + 2XY^2 + XY + X$, $f_1 = X + 2Y^2 + 1$, $f_2 = Y^2 + Y$. Divide f by $\{f_1, f_2\}$ considering the monomial order $<_{\text{lex}}$. Divide f by $\{f_1, f_2\}$ considering now the monomial order $<_{\text{grlex}}$.

Exercise B: Investigate how to define monomial orders in Maple and Sage.

Exercise C: Compute, in Maple and Sage, the S-polynomial of two polynomials in $\mathbb{F}_q[x_1, x_2, x_3, x_4]$.

Exercise D: Compute, in Maple and Sage, a Gröbner basis of an ideal in $\mathbb{F}_q[x_1, x_2, x_3, x_4]$ with respect to the 3 monomial orders considered in the lecture.

Exercise E: Read examples 21.1, 21.2, 21.3.

Best regards,

Diego