

Computer Algebra (2014)-Aalborg University

Lecture 10, November 18th

10th Lecture: Tuesday November 18th, 12:30-16:15 at room G5-109.

- 12:30-14:15 Lecture: Monomial ideals and Hilbert's basis theorem, Gröbner bases and S-polynomials, Buchberger algorithm (pages 601–610).
- 14:15-16:15 Work in groups: A, B, C, D, 21.21, 21.23, 21.17, E, 21.9 (only i), C + exercises from the first set of exercises.

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 Sage.

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

Exercise D: Compute in 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 previous lecture.

Exercise E: Read examples 21.1, 21.2, 21.3.

Best regards,

Diego