CM30070: material covered

J.H. Davenport — J.H.Davenport@bath.ac.uk
(Thanks to David Wilson)

19 November 2011

Date/format Book Topic
3/10/11: L — Basic tour of Maple’s features and structure
6/10/11: L 1.2 Representations. Normal and canonical representations.
6/10/11: L 2.1.1–3 Polynomials in one variable: sparse or dense storage?
Karatsuba’s method. Factored representations
10/10/11: L 2.1.4–5 Polynomials in several variables: recursive, distributed.
Admissible orderings. Alternative representations like DAGs. Rational functions: GCDs.
13/10/11: L 2.3.1–2 Euclid’s algorithm. Gauss’ Lemma. Pseudo-remainder.
Subresultant Algorithm.
13/10/11: C — How to manipulate polynomials with Maple.
17/10/11: L 2.3.4–5 Complexity of polynomial GCD. GCD and Square-free
decomposition.
20/10/11: L 3.2.1–3 Linear equations in several variables. Why we don’t calcul-
late matrix inverses. Dodgson-Bareiss algorithm/theorem.
20/10/11: C Discussion about coursework. For Q2 students can use
prem in Maple
24/10/11: L 3.2.4; 3.1 Sylvester matrix. Over and underdetermined systems of
equations. Equations in one variable.
27/10/11: C General Maple queries about loops, procedures, sets vs
lists.
31/10/11: L 3.1.4–6; 3.1.9 Algebraic Numbers. Capelli’s Theorem. How many real
roots? Sturm’s Theorem.
3/11/11: L 3.3 Introduction to nonlinear equations and reduction
7/11/11: L 3.3.1–2 Gröbner Bases. Buchberger’s Algorithm. Zeroes and
Varieties.
7/11/11: L 3.3.3 Orderings: plex, grlex, tdeg, matrix.
10/11/11: C Discussion about the definitions of polynomial ideals and
varieties.
14/11/11: L 3.3.6–8 Gianni-Kalkbrener Theorem. Complexity of calculating
plex vs tdeg Gröbner Bases. FGLM. Shape Lemma
15/11/11: C Using Maple to calculate Gröbner Bases. How Maple acts 'cleverly' when calculating them.
17/11/11: C Examples of modular calculations. 
21/11/11: L 4.1 Rest of 4.1; also introduction to the bivariate problem. 
22/11/11: C More Maple 
24/11/11: L 4.2–3 The bivariate problem (which is very largely *déjà vu* from the modular problem. Start of 4.3, state theorem 26, and that the main challenge is sparsity, which is the rest of 4.3 (not covered this year). 
24/11/11: C Explain why $A_y-v$ in the multivariate case is analogous to $A_p$ in the univariate case, and how this unifies 4.1 and 4.2. 
28/11/11: L 4.4:5 Overview of Modular methods for Gröbner bases. Note that a prime is bad with respect to a calculation, rather than an abstract problem, here. “Sledgehammer” proof that there are only finitely many bad primes. Hilbert-badness. 
The factorisation problem. All primes *can* be bad. The ‘matching up’ problem: why Chinese Remainder doesn’t work. 
6/12/11: C More Maple. 
8/12/11: C Discussion of Coursework Q4. Sample solution 
12/12/11: L 7.4–5 Integration of logarithmic functions. Integration of exponential functions. 
15/12/11: L 7.8.1 Summary of methods to solve integration and Risch Differential Equation problems. 

‘L’= lecture ‘C’= class.