

CMSC 656
Symbolic and Algebraic Processing
Spring, 1991

Instructor: Howard E. Motteler

Time: TuTh 11:30–12:45

Texts: (1) Computer Algebra, by Davenport, Siret & Tournier
(2) The Art of Computer Programming, Vol.2, by D. Knuth
(3) (Recommended) Macsyma Reference Manual

Course Outline:

1. Introduction to Macsyma: examples and applications (DS&T Ch. 1, Pavell&Wang, handouts)
2. Rational Arithmetic (Knuth section 4.5)
 - Fractions
 - Greatest common divisor
 - Factoring and primality testing
3. Polynomial Arithmetic (Knuth section 4.6, DS&T chapter 4)
 - Unique factorization domains
 - Polynomial division
 - Greatest common divisor
 - Factoring polynomials
4. Manipulation of Power Series (Knuth section 4.7)
5. Data Representation (DS&T chapter 2)
 - Representing integers and fractions
 - Canonical and normal forms for polynomials
 - Polynomials in several variables
 - Algebraic functions
 - Matrices
6. Polynomial Simplification (DS&T chapter 3)
 - Rings and ideals
 - Standard (Gröbner) bases
 - Solving polynomial equations
 - Buchberger's Algorithm
7. Formal Integration (DS&T section 5.1)

Grading will be based on regular problem sets and a number of short projects in Macsyma or Mathematica. There will be one assignment due approximately every two weeks.