

Programming Assignment I (due Monday, October 15, 2012)

1. Implement both the recursive and iterative version of the Division Algorithm in MAPLE for univariate polynomials. Your programs should not use any in-built MAPLE functions (besides the operations of addition, subtraction and multiplication of polynomials). You will most likely need to use the *simplify()* command to simplify the intermediate polynomials you generate. Without this you might run into an infinite loop because MAPLE is computing the degrees of polynomials in an unexpected manner.
2. Carry on the following experiment with MAPLE: Learn how to generate random univariate polynomials with fixed number of terms using *randpoly()*. For many such polynomials use the *solve()* command to find its roots and count the number of real roots you have, tabulate this against the degree and the number of terms. Make sure your polynomials take on a wide range of coefficients. Can you extract some kind of rule as to what is the largest possible number of real roots?
3. Write a MAPLE program that implements the extended Euclidean algorithm over $\mathbb{Q}[x]$. Use the “option remember” when you define the recursive procedure to make it go faster. Experiment with 100 pairs of random polynomials with coefficients over \mathbb{Z} (calculations are done over the rationals). How often are the polynomials relatively prime?