MATH 340 Assignment 4, Fall 2010

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This assignment is due Friday October the 22nd at 11:20 am.
For problems involving Maple, please submit a printout of a Maple worksheet.
Late penalty: -20% for up to 72 hours late. Zero after that.

Section 2.2: Subrings and Subfields

Exercises 1, 3(iv), 6, 7, 8, 14, 16.

Section 2.4: Polynomials

Exercises 1, 3, 12, 13, 14.

Do questions 12 and 13 by hand. Now check your answers using Maple. For part (i) of questions 12 and 13, use the `quo`, `rem` and `gcd` commands. For parts (ii) and (iii) use the `Quo(...) mod p`, `Rem(...) mod p` and `Gcd(...) mod p` commands.

For question 14 (which will be marked) do not do it by hand. First use the `gcdex(...)` command in Maple to answer part (i) and then the `Gcdex(...) mod p` command to answer parts (ii) and (iii). Indicate what the $\lambda(x)$ and $\mu(x)$ polynomials are.

Now use Maple to answer question 14 as follows: Write a loop in Maple that implements the extended Euclidean algorithm to compute the polynomials q_i, r_i, x_i and y_i as illustrated in the table on page 107 (page 93 in the old notes). Recall from section 1.3 that $r_i = r_{i-2} - q_i r_{i-1}$, $x_i = x_{i-2} - q_i x_{i-1}$ and $y_i = y_{i-2} - q_i y_{i-1}$ where q_i is the quotient of r_{i-2} divided by r_{i-1}. Print out the q_i, r_i, x_i, and y_i polynomials using the `printf` command.

For 14 (i) use the Maple commands `quo` and `expand` to divide and to multiply polynomials in $\mathbb{Q}[x]$ respectively. For 14 (ii) and (iii) use the Maple commands `Quo(...) mod p` and `Expand(...) mod p` to divide and multiply polynomials in $\mathbb{Z}_p[x]$ respectively. So you need two versions of the code, one for $\mathbb{Q}[x]$ and one for $\mathbb{Z}_p[x]$.

Section 2.5: Polynomial Evaluation and Interpolation

Exercises 1, 2, 3, 6, 7, 11.