18.310 Homework # 9

Due Wednesday, November 12, 2008

Spreadsheet homework problems should be submitted by Stellar.

1. Set up a spreadsheet that does the FFT for N = 16. Make your calculations mod a prime p that possesses a primitive 16th root of 1. Make sure the cells where the input sequence is entered are clearly marked. Take the FFT of the output (using a second copy of your spreadsheet) and use the output of the first as the input to the second. Make sure your spreadsheet works by multiplying the results by the inverse of 16 (mod p). (You should get your original sequence back with the order of coefficients backwards except for the 0-power.)

   Some examples for p are 17, 97 and 193. HINT: if you use dollar signs appropriately you can copy your FFT calculator somewhere else and alter p or the root you use, or the input sequence, and find the resulting FFT with no more work.

2. Take two 16-digit numbers A and B, each of which is written as a polynomial of degree seven with coefficients less than 100. Take the N=16 FFT of both mod p, take the sequence consisting of the products of the outputs of the corresponding elements of the two outputs as input to a third FFT (again mod p), and multiply each of the coefficients of the result by the inverse of 16 (mod p). Make sure that the cells where the input sequence is entered—and where the output is found—are all clearly marked.

   Notice when you input the number 1234 here the constant term is 34 and the coefficient of x is 12. The same sort of thing is true for larger numbers.