E-402-STFO Problems for Module 4

Updated December 6, 2024

100 points give you full marks. This set of problems revolve around convolutions. This means focusing mostly on the fast fourier transform and number theoretic transform. All problems in this module are on Kattis, and further details are found there..

`m4p1`, 10 points Implement a polynomial multipication algorithm in $\mathcal{O}(n^2)$.

`m4p2`, 25 points Implement a polynomial multipication algorithm in $\mathcal{O}(n \log(n))$ (by using FFT).

`m4p3`, 15 points Find all ways to write a value as the sum of two numbers from a multiset.

`m4p4`, 20 points Find all pythagorean triplets modulo n.

`m4p5`, 15 points Find all ways to cyclically rotate a vector to make it orthogonal to another vector.

`m4p6`, 20 points Make a program to find a primitive root modulo m.

`m4p7`, 20 points Implement the number theoretic transform.

`m4p8`, 30 points Find the number of ways to get all results from a particular set of dice. This problem is harder than the others and should be considered a bonus problem.