SC205- Discrete Mathematics

Home Work 5

Tutorial Discussion Week: February 17, 2020

(1) Show that the set of real numbers $\mathbb{R}$ is uncountable?

(2) Find the Eigenvalues and Eigen vectors of Hadamard matrix of order 4 constructed from tensor product.

(3) Show that the Eigenvalues of a Fourier matrix of order 4 are $\{1, -1, i, -i\}$ with appropriate multiplicities.

(4) Construct a Hadamard matrix using a prime $p = 11$.

(5) What are the conditions on c_j in order that the circulant matrix $C = circ(c_1, c_2, \ldots, c_n)$ be symmetric?

(6) Show that $circ(1, 1, 1, -1)$ is an Hadamard matrix. It has been conjectured that there are no other circulants that are Hadamard matrices. This has been proved for orders $\leq 12,100$. Write computer program to verify this for whatever large order that is possible to handle.