Math 3502: Combinatorial Optimisation. Example sheet 7.

1. Use Strassen's algorithm to multiply

$$\begin{pmatrix} 3 & 4 & 0 & 1 \\ 8 & 5 & 1 & 1 \\ 1 & 3 & 5 & 7 \\ 6 & 2 & 4 & 8 \end{pmatrix}$$

and

$$\begin{pmatrix} 2 & 5 & 2 & 0 \\ 3 & 1 & 2 & 2 \\ 9 & 0 & 0 & 3 \\ 3 & 4 & 5 & 0 \end{pmatrix}$$

2. Find the Discrete Fourier Transform of $(2, 1, i, 2 - i)$.

3. A cubic polynomial has values 4, 2, 3, 1 at 1, i, -1 and $-i$, respectively. What is its value at 2?

4. Illustrate how to use **FFT** to multiply the polynomials $2 - x + 3x^2$ and $1 + 3x - 6x^2 + x^3$.