Recall the matrix defined in class for each $N$, by $(G_N)_{i,j} = \omega_N^{ij}$ with $\omega_N$ the $N^{th}$ root of unity.

1. Explicitly compute $G_N$ for $N = 6$. Your entries should be exact numbers, not decimals. For example, $G_{5,4} = \omega_5^{20} = \omega^2 = e^{4\pi i/6} = \cos(2\pi/3) + i\sin(2\pi/3) = -1/2 + i\sqrt{3}/2$

2. Show that the last row of $G_N$ for any $N$ can be reduced to

$1, \omega^{-1}, \omega^{-2}, \ldots, \omega^{-(N-2)}, \omega^{-(N-1)}$

and then show this is equal to

$1, \omega^{N-1}, \omega^{N-2}, \ldots, \omega^2, \omega$

and also to

$1, \omega, \omega^2, \ldots, \omega^{(N-2)}, \omega^{(N-1)}$. 