

## Theory

8.1 Entries of  $(i, j)$  element in DFT matrix give  $w_N^{(i-1)(j-1)}$

where  $i = 1, \dots, N$

$j = 1, \dots, N$

$$w_N = e^{-j\frac{2\pi}{N}}$$

8.2 When  $N = 2$

Let the input indices be  $x[0], x[1]$

$$\text{then } y[0] = x[0] + x[1]$$

$$y[1] = x[0] - x[1]$$

8.4 a) In FFT based we do  $N$  computations for each level. And there are ~~are~~  $\log_2 N$  levels

$\Rightarrow$  Complexity  ~~$O(N \log_2 N)$~~   $O(N \log_2 N)$

b) In Direct FFT we have  $N$  computations per level and  $N$  levels

$\Rightarrow$  Complexity  $O(N^2)$