



$\mathbf{x} = (x(0), \dots, x(N-1))$ . The orthonormal basis are  $\{\mathbf{e}_i, i=1, \dots, N\}$  where

$$\mathbf{e}_i = \left( \frac{1}{\sqrt{N}} \exp\left(\frac{j2\pi(i-1)n}{N}\right) : n = 0, \dots, N-1 \right)$$

- a) Show that  $\langle \mathbf{x}, \mathbf{e}_i \rangle$  corresponds to the analysis formula of the  $(i-1)^{\text{st}}$  DFT coefficient.
- b) Show that equation (2) in the signal space corresponds to the synthesis formula of DFT.
- c) Prove that the set  $\{\mathbf{e}_i, i=1, \dots, N\}$  as defined above is orthonormal.