complex conjugate?

1. $\cancel{\Sigma} = (1, \omega^{i}, \omega^{2i}, \ldots \omega^{(n-1)i}) \cdot (1, \omega^{j}, \omega^{2j}, \ldots \omega^{(N-1)j})$

$= 1 \cdot 1 + (e^{2\pi i/N})^{i} (e^{2\pi i/N})^{j} + (e^{2\pi i/N})^{2i} (e^{2\pi i/N})^{2j} + \ldots$

$= 1 + e^{-2\pi/N} \cdot \cancel{1} + e^{-4\pi/N} \cdot 1 + \ldots + e^{-(N-1)^2 2\pi/N}$

$= \cancel{4\pi} \; \Sigma$

2. $(e^{-2\pi i/N})^{\frac{1}{2}N} = e^{-i\pi} = -1$ ✓

3. $F_3 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & i & i^2 \\ 1 & i^2 & i^4 \end{bmatrix}$ $\quad \Omega_3 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -i & -i^2 \\ 1 & -i^2 & -i^4 \end{bmatrix}$

$P_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

4. DFT of $(0,1,0,0)$, $c = ?$

$c = \frac{1}{N} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -i & -i^2 & -i^3 \\ 1 & -i^2 & i^4 & -i^6 \\ 1 & -i^3 & -i^6 & -i^9 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} \quad \frac{1}{4} \begin{bmatrix} 1 \\ -i \\ -i^2 \\ -i^3 \end{bmatrix} = \cancel{\frac{1}{4} \begin{bmatrix} 1 \\ -i \\ \\ -i \end{bmatrix}} = \frac{1}{4} \begin{bmatrix} 1 \\ -i \\ 1 \\ i \end{bmatrix}$

$Fc = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & i & i^2 & i^3 \\ 1 & i^2 & i^4 & i^6 \\ 1 & i^3 & i^6 & i^9 \end{bmatrix} \frac{1}{4} \begin{bmatrix} 1 \\ -i \\ 1 \\ i \end{bmatrix} = \frac{1}{4} \big(1 - i + 1 + i, \; 1 + 1 - 1 + 1,$

6.

7 $f = \begin{cases} 1 & |x| \le \pi/2 \\ \end{cases}$

$$\int_{-\pi}^{\pi} f = \cancel{\int_{-\pi}^{-\pi/2} f} + \int_{-\pi/2}^{\pi/2} f + \cancel{\int_{\pi/2}^{\pi} f}$$

$$a_0 = \pi/2 - -\pi/2 = \boxed{\pi}$$

$$\int_{-\pi/2}^{\pi} f(x)\cos(x) = \int_{-\pi/2}^{+\pi/2} \cos(x)$$

$$\sin(\pi/2) - \sin(-\pi/2)$$

$$a_1 = 1 - -1 = 2$$

8. ~~A~~ $=Q$,

$\cancel{A}Q^T x = I x.$ since $QQ^T = I.$

~~Since~~ $\cancel{QQ^T x}$

~~Following the format of~~ $\cancel{a_1 q^T x + \ldots}$

$\cancel{QQ^T x =}$

From 1.5 #5 on p. 29

those N pieces $= 0$!