

$$|\psi\rangle = \begin{pmatrix} -1+1i \\ 3 \\ 2+3i \end{pmatrix}, \langle\phi| = (6 \quad -1i \quad 5), A = \begin{pmatrix} 5 & 3+2i & 3i \\ -1i & 3i & 8 \\ 1-1i & 1 & 4 \end{pmatrix} \quad (1)$$

$$A|\psi\rangle = \begin{pmatrix} 5 & 3+2i & 3i \\ -1i & 3i & 8 \\ 1-1i & 1 & 4 \end{pmatrix} \begin{pmatrix} -1+1i \\ 3 \\ 2+3i \end{pmatrix} = \begin{pmatrix} -5+17i \\ 17+34i \\ 11+14i \end{pmatrix} \quad (2)$$

$$\langle\phi|A|\psi\rangle = (6 \quad -1i \quad 5) \begin{pmatrix} 5 & 3+2i & 3i \\ -1i & 3i & 8 \\ 1-1i & 1 & 4 \end{pmatrix} \begin{pmatrix} -1+1i \\ 3 \\ 2+3i \end{pmatrix} = 59 + 155i \quad (3)$$

$$\langle\phi|\phi\rangle = (-1-1i \quad 3 \quad 2-3i) \begin{pmatrix} 6 \\ 1i \\ 5 \end{pmatrix} = 4 - 18i \quad (4)$$

$$\langle\phi|\psi\rangle = (6 \quad -1i \quad 5) \begin{pmatrix} -1+1i \\ 3 \\ 2+3i \end{pmatrix} = 4 + 18i \quad (5)$$

$$\langle\psi|\psi\rangle = (-1-1i \quad 3 \quad 2-3i) \begin{pmatrix} -1+1i \\ 3 \\ 2+3i \end{pmatrix} = 24 \quad (6)$$

$$\langle\phi|\phi\rangle = (6 \quad -1i \quad 5) \begin{pmatrix} 6 \\ 1i \\ 5 \end{pmatrix} = 62 \quad (7)$$