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

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

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

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

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

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

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