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

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

$$\langle\phi| A = \begin{pmatrix} 6 & -1i & 5 \end{pmatrix} \begin{pmatrix} 5 & 3+2i & 3i \\ -1i & 3i & 8 \\ 1-1i & 1 & 4 \end{pmatrix} = \begin{pmatrix} 34-5i & 26+12i & 20+10i \end{pmatrix} \tag{3}$$