

Step-1

Given that $(A + iB)(x + iy) = Ax + iBx + iAy - By$ where $i^2 = -1$. We have to use blocks to separate the real part from the imaginary part that multiplies i

Step-2

Since by block multiplication from $\begin{bmatrix} A & -B \\ iB & iA \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$ we get

Real part is $(A \ -B) \begin{pmatrix} x \\ y \end{pmatrix} = (Ax - By)$

Imaginary part $(iB \ iA) \begin{pmatrix} x \\ y \end{pmatrix} = \boxed{(iBx + iAy)}$