$$\mathbb{C} = \mathbb{R} + i\mathbb{R}$$

$$x + iy \in \mathbb{R} \implies {}_2\mathbb{R}^2 \ni \begin{array}{c|c} x & y \\ \hline -y & x \end{array}$$

$$\underbrace{x+iy}\,\underbrace{u+iv} = \begin{array}{c|c} x & y \\ \hline -y & x \end{array}\ \begin{array}{c|c} u & v \\ \hline -v & u \end{array} = \underbrace{xu - yv} + i\underbrace{xv + yu}$$