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0.1 Lie algebra of $U(n)$

0.1.1 $U(n)$ forms a Lie group

0.1.2 Lie algebra of $U(n)$

The Lie algebra of (n) is defined as:

$\mathfrak{u}(n) = \{X \in \mathbb{C}^{n\times n} | e^{tX} \in U(n) \forall t \in \mathbb{R}\}$

This is satisfied by the skew-Hermitian matrices where $M = -M^*$. Note that this means the diagonals are all 0 or pure imaginary.