1 Uniform Matrix Transformation

Definition:

$$\mathbf{U}^\dagger \mathbf{U} = \mathbf{I} \tag{1}$$

1.1 Exponential Parameterization

Prove that: $\forall$ unitary matrix $\mathbf{U}$, $\exists$ an anti-Hermitian operator $\hat{\kappa}$ such that:

$$\mathbf{U} = e^{-\hat{\kappa}} \tag{2}$$