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3. Consider the matrix

$$A = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}. \quad (1)$$

(a) Is A Hermitian? Explain your answer.

(b) Find the eigenvalues and *normalized* eigenvectors of A .

(c) Construct a unitary matrix U whose columns are the normalized eigenvectors of A , and show by explicit matrix multiplication that U is unitary.

(d) Show by explicit matrix multiplication that some product involving A and U produces a diagonal matrix. (hint: the diagonal elements should be the eigenvalues from part (3b))