1. Prove that for square matrices $A$ and $B$, $|AB| = |A||B|$, where $|.|$ denotes the determinant of a matrix.

2. Prove that $|A| = \frac{1}{|A^\dagger|}$, where $A$ is a square matrix.


4. Let $A$ and $B$ be square matrices. Prove that $\begin{vmatrix} [A \ 0] \\ 0 \ B \end{vmatrix} = |A||B|$.

5. For a Hermitian matrix $A = A^*$, prove
   (i) All eigenvalues of $A$ are real valued.
   (ii) The matrix whose columns are the eigenvectors of $A$ is unitary.