5. (7 pts) True or False:

\[ \text{F} \] Any matrix can be diagonalized by a similarity transformation.

\[ \text{T} \] Any Hermitian matrix can be diagonalized by a unitary transformation.

\[ \text{T} \] The eigenvectors of a Hermitian matrix can always be chosen to be orthonormal.

\[ \text{F} \] The eigenvectors of any \( N \times N \) matrix always span the \( N \) dimensional vector space provided the matrix has determinant \( +1 \).

\[ \text{F} \] All unitary matrices are traceless.

\[ \text{T} \] All antisymmetric matrices are traceless.

\[ \text{T} \] If a matrix has all its eigenvalues different from zero, it must have an inverse.