1. Let $V$ be a finite dimensional complex inner product space. Prove that if $T \in \mathcal{L}(V)$ is normal, then there is an operator $S \in \mathcal{L}(V)$ such that $T = S^2$.

*Hint:* Every complex number has a complex square root.

2. Prove that if $A \in M_n(\mathbb{F})$ is Hermitian, then there are an orthonormal basis $(v_1, \ldots, v_n)$ of $\mathbb{F}^n$ and numbers $\lambda_1, \ldots, \lambda_n \in \mathbb{R}$ such that

$$A = \sum_{j=1}^{n} \lambda_j v_j v_j^*.$$

3. Find the singular value decomposition of $\begin{bmatrix} 2 & 1 \\ 2 & -1 \end{bmatrix}$.

*Hint:* The necessary tools are in Proposition 3.37 and its proof.