Note: Deadline: 22.10.20 upto 11:59 PM. Please submit in a single pdf file and write it properly. I want detailed solutions.

1. Find all the linear transformations f from $\mathbb{M}_n(\mathbb{R})$ to $\mathbb{R}$ such that $f(AB) = f(BA)$ for all matrices $A, B \in \mathbb{M}_n(\mathbb{R})$.

2. Let $\mathbb{V}$ be a finite dimensional vector space and let $\mathbb{W}$ is a subspace of $\mathbb{V}$. Then prove that $\mathbb{W}$ has unique complement if and only if $\mathbb{S} = \{0\}$ or $\mathbb{S} = \mathbb{V}$.