Problem 1. (5 points) Let $G = \left\{ \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix} \mid a \in \mathbb{R} \right\}$. Prove that $G$ is a group under matrix multiplication.

Problem 2. (5 points) Let $G$ be a group of functions from $\mathbb{R}$ to $\mathbb{R}$, where the operation is addition of functions. Prove that $H = \{ f \in G \mid f(1) = 0 \}$ is a subgroup of $G$. 