Proof :

a) Let $S, S' \in \mathcal{L}(V/U, W)$.

$\Gamma(S + S') = (S + S') \circ \pi$

$= S \circ \pi + S' \circ \pi$ (by theorem 3.9 Axler)

$= \Gamma(S) + \Gamma(S')$

Thus satisfy additivity. ✓

Let $\lambda \in \mathbb{F}$. $\Gamma(\lambda S) = (\lambda S) \circ \pi$

$= \lambda (S \circ \pi)$ by 3.6 Axler

$= \lambda \Gamma(S)$

Thus satisfy homogeneity ✓

b). Let S such that $\Gamma(S) = 0$ ← zero map from $V \to W$.

$\Rightarrow S \circ \pi(x) = 0$ for all $x \in V$

$\Rightarrow S(x + U) = 0$ for all $x \in V$

$\Rightarrow S$ is a zero map from $V/U \to W$.