Math 307 Homework
September 9, 2015

1. Prove part 1. of Proposition 1.13.
2. Suppose that $\boldsymbol{T} \in \mathcal{L}(U, V)$ and $\boldsymbol{S} \in \mathcal{L}(V, W)$.
   (a) Show that if $\boldsymbol{ST}$ is injective, then $\boldsymbol{T}$ is injective.
   (b) Show that if $\boldsymbol{ST}$ is surjective, then $\boldsymbol{S}$ is surjective.
3. Suppose that $\boldsymbol{T} \in \mathcal{L}(V)$ is invertible and $v \in V$ is an eigenvector of $\boldsymbol{T}$ with eigenvalue $\lambda \in \mathbb{F}$. Show that v is also an eigenvector of $\boldsymbol{T}^{-1}$. What is the corresponding eigenvalue?