(1) Let $T \in \mathcal{L}(V)$, where $V$ is an inner product space. If $\|T x\| = \|x\|$ for all $x \in V$, show that $T$ is injective.

(2) Let $V = P_2(\mathbb{R})$ be endowed with the inner product $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$. Use the Gram-Schmidt process on the standard ordered basis of $V$ to find an orthonormal basis, and then express the polynomial $f(x) = x - 1$ as a linear combination of the orthonormal basis.

Friedberg p. 337 #8
p. 353 #2b

(1) Show that if $V$ is a real inner product space, then the set of self-adjoint operators on $V$ is a subspace of $\mathcal{L}(V)$. Is this still true if $V$ is complex? Justify your answer.