1. (10 points) A matrix $A$ is said to be skew symmetric if $A^T = -A$. Let $V$ denote the set of skew symmetric $3 \times 3$ matrices.
   a) Show that $V$ is a subspace of $\mathbb{R}^{3\times3}$.
   b) Find a basis of $V$ and the dimension of $V$. 
2. (10 points) Let $V = P_3$ and $T(f) = xf''(x) - f'(x)$ so that $T : V \rightarrow V$.
   a) Find the kernel and image of $T$.
   b) Find the matrix of $T$ with respect to the basis $\mathcal{B} = \{1, x, x^2, x^3\}$. 