(1) Let $V$ and $W$ denote $n$-dimensional vector spaces over the field $F$, and let $V' \subset V$ and $W' \subset W$ denote $m$-dimensional subspaces of $V$ and $W$ respectively. Show that there is an isomorphism $T : V \rightarrow W$ such that $T(V') = W'$.

(2) Do problems #2,3,4,7,16 in section 2.4.

(3) Let $V, W, X, Y$ denote vector spaces over the field $F$, and let $T : V \rightarrow W$ and $S : X \rightarrow Y$ denote linear transformations. We say that $T$ is isomorphic to $S$ if there exits two isomorphisms $f : V \rightarrow X$ and $g : W \rightarrow Y$ such that $g \circ T = S \circ f$.

(a) Show that if $T$ is isomorphic to $S$ then $S$ is isomorphic to $T$.

(b) Show that $T$ is isomorphic to $S$ iff the following hold: $\dim(V) = \dim(X)$; $\dim(W) = \dim(Y)$; $\text{nullity}(T) = \text{nullity}(S)$.

(c) Show that $T$ is isomorphic to $S$ iff there are basis $\alpha, \beta, \sigma, \tau$ for $V, W, X, Y$ respectively such that

$$[T]_{\alpha}^{\beta} = [S]_{\sigma}^{\tau}.$$

(4) Do problems #2bc,3cd,4,5,6b,8,10 in section 2.5.