Problem 1: Recall that a function $L : \mathbb{R}^m \to \mathbb{R}^n$ is linear if $L(x+y) = L(x) + L(y)$ and $L(\alpha x) = \alpha L(x)$ for all $x, y \in \mathbb{R}^m$ and $\alpha \in \mathbb{R}$. Prove that if $L : \mathbb{R}^m \to \mathbb{R}^n$ and $M : \mathbb{R}^n \to \mathbb{R}^p$ are linear, then so is the composition $M \circ L : \mathbb{R}^m \to \mathbb{R}^p$.

Problem 2: Problem A1.6 (p. 858) of Simon and Blume.

Problem 3: Two integers are relatively prime if they have no common factor. (Other than 1, of course.) Prove that if $a$ and $b$ are nonzero relatively prime integers, then there exist integers $x, y$ such that $ax + by = 1$. (Hint: prove things about the set $\{ax + by : x \text{ and } y \text{ are integers} \}$.)