Same rules as Homework 1.

Problem 39 Your signature below indicates you have:

(a.) I read what Cook has posted of Chapter 3 of the Lecture Notes: ____________________.

(b.) I read Sections 3 and 4 of Curtis: ____________________.

Problem 40 Exercise 3 from §4 of Curtis (include explanation for why certain cases are not subspaces)

Problem 41 Let $W = \{(z, w) \in \mathbb{C}^2 \mid (2+i)z + iw = 0\}$. Is W a subspace of $\mathbb{C}^2$? Prove or disprove.

Problem 42 Prove the set of invertible $n \times n$ matrices over $\mathbb{R}$ do not form a subspace for any $n \in \mathbb{N}$.

Problem 43 Let B be a square $n\times n$ matrix of real numbers. Show $W = \{A \in \mathbb{R}^{n\times n} \mid BA = 0\} \leq \mathbb{R}^{n\times n}$.

Problem 44 Consider the differential equation $x^2y'' + \sin(x)y' + 3y = 0$. Show that the solution set forms a subspace of twice differentiable functions from $(0, \infty)$ to $\mathbb{R}$; that is, if the solution set is W, then $W \leq C^2((0, \infty), \mathbb{R})$. Notice, it is easy to show that W is nonempty since the zero function is twice differentiable and clearly solves the given differential equation. You are also given that $C^2((0, \infty), \mathbb{R})$ is a vector space with respect to the usual addition and scalar multiplication of functions.

Problem 45 Suppose V and W are vector spaces over a field $\mathbb{F}$ and $V_1 \leq V$ and $W_1 \leq W$. Prove that $V_1 \times W_1 \leq V \times W$ where $V \times W$ is the vector space with scalar multiplication and vector addition defined by $c(v, w) = (cv, cw)$ and $(v_1, w_1) + (v_2, w_2) = (v_1 + v_2, w_1 + w_2)$ for all $c \in \mathbb{F}$ and $v, v_1, v_2 \in V$, $w, w_1, w_2 \in W$.

Problem 46 Exercise 10 from §4 of Curtis