1. (1 point) Prove explicitly that \( T : \mathbb{R}^3 \rightarrow \mathbb{R}^3 \), \( T(a_1, a_2, a_3) = (0, a_1 + 7a_2 - a_3, a_2 + 3a_3) \) is a linear transformation.

2. (1 point) Prove explicitly that \( T : \mathbb{R}^2 \rightarrow \mathbb{R}^2 \), \( T(a_1, a_2) = (a_1, a_1^2 + a_2^2) \) is not a linear transformation.

3. (1 point) Let \( T : \mathbb{R}^5 \rightarrow \mathbb{R}^4 \), \( T(a_1, a_2, a_3, a_4, a_5) = (a_1 + a_2 - a_5, a_2 - a_4, a_1 + 2a_2 - a_4 - a_5, a_1 + a_4 - a_5) \). Find bases for the kernel and range of \( T \).

4. (1 point) Section 2.1, Problem 10

5. (1 point) Determine explicitly the linear transformation \( T : \mathbb{R}^2 \rightarrow \mathbb{R}^3 \) such that \( T(1, 1) = (1, 1, 2) \) and \( T(0, 1) = (1, 1, 1) \).

6. (2 points) Section 2.1, Problem 13

7. (2 points) Section 2.1, Problem 14

8. (1 point) Section 2.1, Problem 17