Prince Sultan University Dept. of Mathematical Sciences
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1. Determine whether the following sets are subspaces :

$$V = \{(x, y, z) \in \mathbb{R}^3 \ : \ x^2 - y^2 = 0\}, \quad V_2 = \{(a+3b, a-b, 2a-b, 4b) \ : \ a, b \in \mathbb{R}.\}$$

2. Let the vectors $U(2, 0, 1),\ V(1, 2, -1),\ W(0, 4, -4),\ W$ is it in span$\{U, V\}$?

3. $\{U, V, W\}$ are they linearly independent ?

4. Find all values of $a \in \mathbb{R}$ such that $\{X, Y, Z, T\}$ is a basis of $\mathbb{R}^4$, where

$$X = (1, 0, 0, 1),\ Y(1, 1, 0, 2a^2),\ Z(0, -1, 2, 0),\ T(-1, 1, 0, 0).$$

5. Find a basis for the Column space of A and conclude the rank of A.

$$A = \begin{pmatrix} 1 & 0 & 2 & 3 \\ 0 & 1 & 0 & 1 \\ -4 & 1 & 2 & -11 \\ -1 & -1 & 8 & -4 \end{pmatrix}$$

6. Find a basis for the subspace of $\mathbb{R}^3$ spanned by the vectors $e_1(2, -6, 4),\ e_2(-1, 3, -2)$ and $e_3(3, -9, 6)$.