

Examples of subspaces

1. Locally speaking, when an aircraft is flying, it is moving in one direction, and thus assuming it has not changed directions or speed, one could use the velocity vector to determine where the aircraft is relative to the current location at time $t = 0$. Often, it is convenient to consider the current location at time $t = 0$ as the

zero vector. Thus, if the velocity of the plane is given as $\mathbf{v} = \begin{pmatrix} 100 \\ -130 \\ 10 \end{pmatrix}$, then the position of the plane relative

to the current location is $t \begin{pmatrix} 100 \\ -130 \\ 10 \end{pmatrix}$. Does this form a subspace of $\mathbf{R}^3$?

2. Assume that a joystick produces a voltage proportional to θ^2 where θ is the angle between the direction of the stick and the neutral position. Thus, by amplify or attenuating the voltage, one can get all possible $\alpha\theta^2$. Does this form a subspace of all polynomials $\mathbf{R}[\theta]$?

3. The maximum voltage that can be produced by a particular sensor is 5 V. Consequently, any discrete signal (or infinite sequence) of readings from this sensor can be at most 5 V. Is this a subspace of all possible discrete signals? Is this a subset of all bounded discrete signals?

4. Consider the set of all periodic functions defined for $t \geq 0$ a subspace of all functions? Hint: are $\sin(t)$ and $\sin(\pi t)$ periodic? How about $\sin(t) + \sin(\pi t)$?