

Subspace, basis

1. Prove that every line through the origin in \mathbb{R}^3 is a subspace \mathbb{R}^3 .

2. a) Do the vectors $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ form a *basis* for \mathbb{R}^3 ? b) And $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$?

3. Suppose that S consists of all points in \mathbb{R}^2 that are on the x-axis or the y-axis (or both). (S is called the union of the two axes.) Is S a subspace of \mathbb{R}^2 ? Why or why not?