$\mathbb{R}^3$: $\{(1,1,0), (0,0,1)\}$ ... independent, but do they span $\mathbb{R}^3$?

$$\left[\begin{array}{cc|c} 1 & 0 & x \\ 1 & 0 & y \\ 0 & 1 & z \end{array}\right] \to \left[\begin{array}{cc|c} 1 & 0 & x \\ 0 & 1 & z \\ 0 & 0 & x-y \end{array}\right] \to$$

not always 0?

Try $\langle 3,2,1\rangle$

$$\left[\begin{array}{cc|c} 1 & 0 & 3 \\ 1 & 0 & 2 \\ 0 & 1 & 1 \end{array}\right] \to \left[\begin{array}{cc|c} 1 & 0 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{array}\right]$$

$x=3$
$y=1$
$0=1$ yikes!

spanning set:

$$\{a(1,1,0) + b(0,0,1) \mid a,b \in \mathbb{R}\}$$
$$= \{(a,a,b) \mid a,b \in \mathbb{R}\}$$

$\{(1,2,0)\}$ spans a line: $(x, 2y, 0)$ — 1 vector: most I get is a line

$\{(1,1,1), (1,1,0)\}$ spans a plane — 2 vectors: most I get is a plane

$\{(1,1,1), (1,1,0), (1,0,0)\}$ spans $\mathbb{R}^3$ — 3 vectors: most I get is a 3 dimensional space

* To span, I need at least as many vectors as dimensions.

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* Important ① How to use a matrix to tell if linearly independent.
② need at least as many vectors as dimensions to span
(write up) ③ Use a matrix to check for spanning