1. True or False?

The following vectors span $\mathbb{R}^3$.

$$\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

2. True or False?

The following vectors in $\mathbb{R}^3$ are linearly independent.

$$\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

Let V be the vector space whose elements are the differentiable functions $f : \mathbb{R} \to \mathbb{R}$. For example, the function $f(x) = \sin(x)$ is an element of V, but the function $g(x) = |x|$ is *not* an element of V.

3. True or False?

The set

$$S = \left\{ f \in V : \frac{df}{dx} = f \right\}$$

is a subspace of V.

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Follow-up. If you think it is a subspace, can you find a spanning set?

A square matrix is *symmetric* if it stays the same after reflecting all of the entries across the top-left-to-bottom-right diagonal. For example, the following matrix is symmetric.

$$\begin{pmatrix} 1 & 3 & 4 \\ 3 & 2 & 7 \\ 4 & 7 & 5 \end{pmatrix}$$

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The set S of symmetric 3×3 matrices is a subspace of $\mathcal{M}_{3\times 3}$.

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Follow-up. If you think it is a subspace, can you find a spanning set?

5. True or False?

$\mathcal{P}_2$ can be spanned by a set of three polynomials all of which have degree 2.