1. True or False?

The set

$$\left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3 : x + y + z = 1 \right\}$$

is a subspace of $\mathbb{R}^3$.

2. True or False?

The set

$$\left\{ \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3 : x^2 + y^2 = 0 \right\}$$

is a subspace of $\mathbb{R}^3$.

3. True or False?

The set

$$\{p(x) \in \mathcal{P}_2 : p(3) = 0\}$$

is a subspace of $\mathcal{P}_2$.

4. True or False?

The set of all polynomials of degree at least 2, together with the zero polynomial, is a subspace of $\mathcal{P}$.

5. True or False?

Let V be the vector space whose elements are all of the differentiable functions $f : \mathbb{R} \to \mathbb{R}$. Then the set

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

is a subspace of V.

6. True or False?

The set

$$\left\{ \begin{pmatrix} a & a+b \\ 0 & b \end{pmatrix} : a, b \in \mathbb{R} \right\}$$

is a subspace of $\mathcal{M}_{2\times 2}$.