# Math exam
## Linear algebra

Allons, courage et confiance !

# 1   Linear subspaces?

Everything must come with a justification.

1. Let $T \in \mathbb{R}^*$. We recall that a function $f : \mathbb{R} \to \mathbb{R}$ is $T$-periodic if $\forall x \in \mathbb{R}, f(x + T) = f(x)$. Is the set of $T$-periodic function a linear subspace of the linear space of function from $\mathbb{R}$ to $\mathbb{R}$ ?

2. Is $\left\{ (x,y) \in \mathbb{R}^2 \mid x^2 + y^2 \leqslant 0 \right\}$ a linear subspace of $\mathbb{R}^2$ ?

3. Is $\left\{ (x,y,z) \in \mathbb{R}^3 \mid x + y = 0 \vee x + z = 0 \right\}$ a linear subspace of $\mathbb{R}^3$ ?

4. Is the set of divergent sequences a linear subspace of the linear space of real-valued sequences?

5. Let $(a,b) \in \mathbb{R}^2$. Is the set of real-valued sequences $(u_i)_{i \in \mathbb{N}} \in \mathbb{R}^{\mathbb{N}}$ such that $\forall i \in \mathbb{N}, au_i + bu_{i+1} = u_{i+2}$ a linear subspace of the linear space of real-valued sequences?