1. True or False?

Consider the differentiation map $d/dx : \mathcal{P}_3 \to \mathcal{P}_3$, and let A be the matrix representation of this linear map with respect to the standard basis $\langle 1, x, x^2, x^3 \rangle$ of $\mathcal{P}_3$. Then $A^4 = 0$.

2. True or False?

Let B denote the standard basis of $\mathbb{R}^2$. Let $\pi_x : \mathbb{R}^2 \to \mathbb{R}^2$ denote projection onto the x-axis and $\pi_y : \mathbb{R}^2 \to \mathbb{R}^2$ denote projection onto the y-axis. Then

$$\mathrm{Rep}_{B,B}(\pi_x)\,\mathrm{Rep}_{B,B}(\pi_y) = 0.$$