Problem 1 Find the determinant of

\[ A = \begin{bmatrix} 2 & 2 & 0 & 2 \\ 1 & -1 & 0 & 0 \\ 2 & 0 & -1 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} \]

Also, find the determinant of \( A^6 = AAAAAA \).
Problem 2  Prove that if $A$ is not invertible, then $A^n$ is not invertible for any $n \in \mathbb{N}$. (Hint: Think about determinants.)