

An index 3 nilpotent 2×2 matrix

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Let $R = \mathbb{M}_2(S)$ where $S = \mathbb{Z}[x]$ with the relation $x^2 = 0$, and let $T = \begin{bmatrix} x & 1 \\ 0 & 0 \end{bmatrix}$ in R . We have $T^3 = 0 \neq T^2$.