

QUESTION Find a  $2 \times 2$  matrix  $A$  with no zero entries but with  $A^2 = 0$ .

ANSWER

Any matrix of the form

$$A = \begin{bmatrix} a & b \\ -\frac{a^2}{b} & -a \end{bmatrix}$$

satisfies  $A^2 = 0$ .