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**Matrices over Centrally  $\mathbb{Z}_2$ -graded Rings**

We introduce a new computational technique for  $n \times n$  matrices, over a  $\mathbb{Z}_2$ -graded ring  $R = R_0 \oplus R_1$  with  $R_0 \subseteq Z(R)$ , leading us to a new concept of determinant, which can be used to derive an invariant Cayley-Hamilton identity. An explicit construction of the inverse matrix  $A^{-1}$  for any invertible  $n \times n$  matrix  $A$  over a Grassmann algebra  $E$  is also obtained.