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# Inverse-preserving linear maps between spaces of matrices over fields

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摘要

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## Inverse-preserving linear maps between spaces of matrices over fields

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**Abstract** Suppose  $\mathbf{F}$  is a field different from  $\mathbf{F}_2$ , the field with two elements. Let  $M_n(\mathbf{F})$  and  $S_n(\mathbf{F})$  be the space of  $n \times n$  full matrices and the space of  $n \times n$  symmetric matrices over  $\mathbf{F}$  respectively. For any  $G_1, G_2 \in \{S_n(\mathbf{F}), M_n(\mathbf{F})\}$ , we say that a linear map  $f$  from  $G_1$  to  $G_2$  is inverse-preserving if  $f(X)^{-1} = f(X^{-1})$  for every invertible  $X \in G_1$ . Let  $\mathcal{L}(G_1, G_2)$  denote the set of all inverse-preserving linear maps from  $G_1$  to  $G_2$ . In this paper the sets  $\mathcal{L}(S_n(\mathbf{F}), M_n(\mathbf{F}))$ ,  $\mathcal{L}(S_n(\mathbf{F}), S_n(\mathbf{F}))$ ,  $\mathcal{L}(M_n(\mathbf{F}), S_n(\mathbf{F}))$  and  $\mathcal{L}(M_n(\mathbf{F}), M_n(\mathbf{F}))$  are characterized.

**Key words** [Field](#) [Inverse-preserving linear map](#) [Space of full matrices](#) [Space of symmetric matrices](#)

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