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Subalgebras of $\mathfrak{gl}(3,\mathbb{R})$

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Abstract: This paper finds all subalgebras of $\mathfrak{gl}(3,\mathbb{R})$ up to change of basis in $\mathbb{R}^3$. For each such algebra the corresponding matrix Lie subgroup of $\mathrm{GL}(3,\mathbb{R})$ obtained by exponentiation is given. An interesting phenomenon is that for algebras of dimension three and higher one frequently encounters inequivalent subalgebras and subgroups, one obtained from the other, by transposing about the anti-diagonal.

Key words: three-dimensional matrix, Lie algebra, Lie group, solvable algebra, non-trivial Levi decomposition.

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