

## THE GENERALIZATION OF THE KAC-BERNSTEIN THEOREM

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*Abstract:* The Skitovich-Darmois Theorem of the early 1950's establishes the normality of independent  $X_1, X_2, \dots, X_n$  from the independence of two linear forms in these random variables. Existing proofs generally rely on the theorems of Marcinkiewicz and Cramér, which are based on analytic function theory. We present a self-contained real-variable proof of the essence of this theorem viewed as a generalization of the case  $n = 2$ , which is generally called *Bernstein's Theorem*, and also adapt an early little known argument of Kac to provide a direct simple proof when  $n = 2$ . A large bibliography is provided.

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**Key words and phrases:** independence; characterization; normality; Bernstein's theorem; Cramer's theorem; Marcinkiewicz's theorem; characteristic function; Laplace transform; real-variable; real function; moments; cumulants.

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