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A general Gauss theorem for evaluating singular integrals
over polyhedral domains

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**Abstract**

A general Gauss divergence theorem with applications to convolution integrals of the form

\[ f(x)h(|x - a|)dV, \]

where the integration extends over an \( n \)-dimensional polyhedral domain, is

presented. The kernel \( h(|x - a|) \) may be singular, but the given integral must remain inte-

grable. As a result of the Gauss theorem, the given integral is reduced to an integral over

the boundary of the \( n \)-dimensional polyhedral domain, which can be expressed as a sum of

similar integrals over \((n - 1)\)--dimensional polyhedral domains. The technique is illustrated

with the evaluation of potential integrals for uniform and linear source distributions on polyg-

onal domains, which is known to be of particular importance in the numerical treatment of

electromagnetic problems.