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Review text: Attention is paid to the evaluation of a certain six-dimensional integral which is often encountered as describing the self-energy of a system or an interaction between two systems. The basic idea lies in a suitable change of variables which reduces the problem to the one-dimensional integration over a product of the potential V (typically: repulsion of a Coulombic, van der Waals or even more singular type) with a factor called the radial density function G. The closed form of G is known for some special cases of interest (say, uniform spherical distribution). In the paper, function G is calculated for several other situations characterized, say, by the Gaussian non-uniform distribution or even by the different support volumes of the two input densities. An ample reference to an unpublished PhD thesis by M. Parry is made. Discussion shows that the technique proves particularly useful when the singularity of V is regularized at a small radius (like, e.g., in certain neutron-star applications) so that the application of alternative methods becomes prohibitively difficult.