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Following the general approach from the theory of semigroups one can define the so-called ‘carré du champs’ or gradient operator. This concept has a geometrical flavor when applied to semigroups coming from Riemannian metrics. The same concept plays also an important role in probability. Bakry’s work is fundamental in this direction. From the geometric point of view we should expect to be able to compare spatial and time derivatives, at least in terms of L_p -norms for finite p . In special cases this leads to classical bilinear singular integrals.

We study this concept for the free group, explain the meaning of the gradient, the Γ_2 condition and finite diameter. We present first results on bilinear singular integrals in case of subordinated semigroups. (Received August 22, 2006)