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Effects of divergent ghost loops on the Green's functions of QCD

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I discuss certain characteristic features encoded in some of the fundamental QCD Green's functions, whose origin can be traced back to the (Landau gauge) nonperturbative masslessness of the ghost field. Specifically, the ghost loops that contribute to these Green's functions display infrared divergences, akin to those encountered in the perturbative treatment, in contradistinction to the gluonic loops, whose perturbative divergences are tamed by the dynamical generation of an effective gluon mass. In d=4, the aforementioned divergences are logarithmic, thus causing a relatively mild impact, whereas in d=3 they are linear, giving rise to enhanced effects. In the case of the gluon propagator, these effects do not interfere with its finiteness, but make its first derivative diverge at the origin, and introduce a maximum in the region of infrared momenta. The three-gluon vertex is also affected, and the induced divergent behavior is clearly exposed in certain special kinematic configurations, usually considered in lattice simulations; the sign of the corresponding divergence is unambiguously determined.
The picture that emerges is finally compared to the available lattice data.

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