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Excitonic Gap from Long-Range Coulomb Interaction in Graphene JOSE GONZALEZ, Instituto de Estructura de la Materia (CSIC), Madrid, Spain — We apply renormalization group methods to analyze the development of an excitonic gap in the theory of Dirac fermions in graphene with long-range Coulomb interaction. In the large-N approximation, we show that the chiral symmetry is only broken below a critical number of two-component Dirac fermions $N_c = 32/\pi^2$, that is precisely half the value found in quantum electrodynamics. Adopting otherwise a ladder approximation, we give evidence of the existence of a critical coupling at which the order parameter of the transition to the gapped phase diverges. This result supports that the opening of an excitonic gap may be driven by a sufficiently strong Coulomb interaction, despite the divergence of the Fermi velocity at low energies in the Dirac theory of graphene.

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