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A finite difference method for transport of massless Dirac fermions: The case of graphene nanoribbons[1] CAIO LEWENKOPF, Universidade Federal Fluminense - Brazil, ALEXIS HERNANDEZ, Pontificia Universidade Catolica do Rio de Janeiro - Brazil — We develop a new finite difference scheme to numerically compute the scattering matrix of two-dimensional massless Dirac fermions propagating in a ribbon geometry. The method is nonlocal, avoids the fermion doubling problem, and is suitable for introducing different kinds of boundary conditions. To illustrate its utility we compute the Landauer conductance of a monolayer graphene sheets with zig-zag boundary conditions in presence of a perpendicular magnetic field. The method is particularly useful in the study of long range disorder effects (much larger than the lattice spacing) in large graphene strips. In passing, we also show how the method works in the description of electronic transport at the surface of three-dimensional topological insulators.

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