Non-perturbative renormalization group calculation of the quasiparticle velocity and the dielectric function of graphene. ANAND SHARMA, CARSTEN BAUER, ANDREAS RUECKRIEGEL, PETER KOPIETZ, Univ Frankfurt — We use a nonperturbative functional renormalization group approach to calculate the renormalized quasiparticle velocity $v(k)$ and the static dielectric function $\epsilon(k)$ of suspended graphene as function of an external momentum $k$. We fit our numerical result for $v(k)$ to $v(k)/v_F = A + B \ln(\Lambda_0/k)$, where $v_F$ is the bare Fermi velocity, $\Lambda_0$ is an ultraviolet cutoff, and $A = 1.37, B = 0.51$ for the physically relevant value ($e^2/v_F = 2.2$) of the coupling constant. In stark contrast to calculations based on the static random-phase approximation, we find that $\epsilon(k)$ approaches unity for $k \to 0$. Our result for $v(k)$ agrees very well with a recent measurement by Elias et al. [Nat. Phys. 7, 701 (2011)]. With in the same approximation, we also explore an alternative scheme in order to understand the true nature of the low energy (momentum) behavior in graphene.