Problem C14.1 In the lecture the asymptotic fermion mass was computed from the HTL selfenergy $\Sigma(p)$, for which we assumed $|p^\mu| \ll T$. Now consider $\Sigma(p)$ for larger momenta $|p^\mu| \geq T$, but close to the lightcone, $|p^2| \lesssim e^2T^2$. Show that the asymptotic mass is the same as the one from the HTL approximation.

Hint: Like in the lecture consider $\mathrm{tr}(\Sigma(p)\not{p})$, but now before doing the Matsubara sum or any partial fractioning.

Problem H14.1

(a) Show that the the linearized Vlasov equations together with Maxwell's equations conserve the Hamiltonian

$$H = \frac{1}{2}\int d^3x \left\{ \mathbf{E}^2(x) + \mathbf{B}^2(x) + m_{\mathrm{D}}^2 \int \frac{d\Omega}{4\pi} \left[W(x,\mathbf{v})\right]^2 \right\}.$$

(b) Show that for non-abelian theories the same Hamiltonian with $\mathbf{E}^2 \to \mathbf{E}^a \cdot \mathbf{E}^a$ etc. is conserved.