Finite temperature field theory (FTFT) Excercise 6.

Return by 12.00, Monday 8.11.2021,
(electronically to olli.a.koskivaara@student.jyu.fi or in paper to a box outside Fys.1.)

1. Compute the parametres of the dimensionally reduced 3d-theory at one loop level in the Yukawa theory:

$$\mathcal{L} = \frac{1}{2}(\partial_\mu \phi)^2 + \frac{m^2}{2}\phi^2 + \frac{\lambda}{4!}\phi^4 + \sum_i \Big(\bar{\psi}_i (i\not{\partial} - m_i)\psi_i - y_i \bar{\psi}_i \phi \psi_i \Big).$$

2. Compute the thermal Debye masses of all particles in the scalar-QED, including N_f flavours of fermions coupling to ϕ with couplings y_f. Use the Feynman gauge.

3. Compute the self-energy function Σ appearing in the correction term to the potential in the sclar QED, in the model with N_f fermions in the Feynman gauge. This is a straightforward, but a somewhat long task that involves computing several finite loop-correction terms, in particular with the gauge correction. So do as much as you feel reasonable.