QUANTUM FIELD THEORY II
(KREIMER, SUMMER 2018)

EXERCISE I (MAY 14 2018, TO BE HANDED IN JUNE 18 2018)

- 1.(20 points)
  In ϕ_4^4 theory, determine all graphs contributing to the self-energy up to two loops and determine their symmetry factors.

- 2.(50 points)
  Determine their renormalized integrands (not integrals) in parametric renormalization. Use renormalization conditions such that the self-energy $\sigma(q^2, m^2$ and its first derivative vanish at $q^2 = m^2$.

- 3.(30 points)
  Using either dimensional regularization or a parametric cut-off, determine the corresponding expressions for the counterterms needed in the Lagrangean.