The $\lambda\phi^3$ theory.
Consider the theory of a scalar field ϕ with mass m and a $\frac{\lambda}{3!}\phi^3$ self-interaction in d dimensions.
a.) Write down the Lagrange density $\mathscr{L}$ and explain your choice of signs.
b.) Determine the dimension of the field ϕ and of the coupling λ in d dimensions. Fix d such that the coupling λ is dimensionless.
c.) Draw the Feynman diagram(s) and write down the analytical expression for the self-energy $i\Sigma$ (i.e. the one-loop correction for the free propgator) in momentum space.
d.) Determine the symmetry factor of $i\Sigma$.
e.) Calculate the self-energy $i\Sigma$ using dimensional regularisation.
f.) Determine the running of the mass $m(\mu)$.

–The end–

Please drop your solutions in my mailbox (D5-166) before Thu, 20.3. at 10.00, hand them in during the lectures or sent them by email.