

Homework 2

1. Consider the Euclidean field theory with N real scalar fields ϕ_i with Lagrangian density

$$\mathcal{L} = \frac{1}{2}\partial_\mu\phi_i\partial_\mu\phi_i + \frac{1}{2}m^2\phi_i\phi_i + \frac{\lambda}{4}(\phi_i\phi_i)^2.$$

- (a) Calculate $\gamma_m(\lambda)$ and $\beta(\lambda)$ to lowest order in perturbation theory.
 - (b) What is the location of the Wilson-Fisher fixed point in $4 - \epsilon$ dimensions?
 - (c) What is the value of the critical exponent ν in this theory in $d = 3$, to lowest order in the epsilon expansion?
2. Questions abcde in Problem 1 from Silviu Pufu's lectures at the Sao Paulo bootstrap school, <http://bootstrap.ictp-saifr.org/school>
 3. Srednicki problems 51.1 and 52.2 (loops in Yukawa theory).