Homework 10

1. Srednicki problem 15.1
2. Srednicki problem 21.1
3. Srednicki problem 28.3
4. 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?