

## PH 6140:Homework Set 4

Due in class on Jan 24

1. Consider the 0-dimensional field theory with a single “scalar” field,  $\varphi$  with  $-g\varphi^4$  interaction term discussed in class. Compute the four point correlation function (fourth order moment)  $\langle\varphi^4\rangle$  in this theory to second order in perturbation theory in  $g$  using (i) evaluating the path integral(s), (ii) by using the Feynman diagram rules of this theory.
2. Consider again 0-dimensional field theory with a single scalar field,  $\varphi$ , but this time with a  $-g\varphi^3$  interaction term.
  - (A) Write down the Feynman rules of the theory (propagators, vertices and symmetry factors)
  - (B) Compute  $\langle\varphi\rangle$  up to  $O(\lambda^3)$  by evaluating functional integrals
  - (C) Compute  $\langle\varphi\rangle$  up to  $O(\lambda^3)$  by using the Feynman diagram rules obtained for part (A).