Week 1 (due Jan. 16)

Reading: Srednicki, sections 21, 28.

1. Consider a scalar field theory with a dimensionless coupling α with a 1-loop beta-function $\beta(\alpha) = -b_0\alpha^2$, where $b_0 > 0$. That is, this theory is asymptotically free. Suppose the anomalous dimension of the field at 1-loop order is $\gamma = c\,\alpha$ for some numerical constant c. Determine the behavior of the 2-point Green's function at asymptotically large momentum. (You should get that the asymptotics of the Green's function differs from that in the free theory by logarithmic corrections).

2. Problem 21.3 in Srednicki.

3. (20 pts) Problem 28.1 in Srednicki.