

**Homework 5; due Tuesday, Nov. 5**

1. Calculate the 1-particle irreducible 2-point function for a quantum particle with potential  $U(q) = m^2 q^2/2 + gq^4/4!$  modulo  $g^3$  (in momentum space, for  $\hbar = 1$ ). In class we did it modulo  $g^2$ .
2. Let  $U(q) = m^2 q^2/2 + gq^3/3$ . Calculate the leading term of the 1-point function  $\mathcal{G}_1(t)$  (with respect to  $g$ ).
3. In problem 2, calculate the connected 2-point function modulo  $g^3$ .
4. Consider the potential  $U(q) = m^2 \sinh^2(gx)/2g^2$ . Find a formula for  $W_0(J)$  (the tree part of  $\ln(Z(J)/Z(0))$ ) as explicitly as you can.