

**Problem#20**

Calculate the imaginary part of the Lindhard function (bubble diagram). Guidance can be found in Fetter & Walecka p.158-163. Be sure that you can sketch this imaginary part for the two cases  $q < 2k_F$  and  $q > 2k_F$ . Note that this imaginary part corresponds to the dynamic structure function in the simplest approximation.

**Problem#21** Obtain the dynamic structure function in the ring approximation for different strengths of the particle-hole interaction (both attractive and repulsive). Note that you now need both the real and imaginary part of the Lindhard function. Illustrate your results with some plots as a function of energy.

**Problem#22**

Calculate the strength of the residue of the plasmon pole in terms of the derivative of the Lindhard function.

**Problem#23**

Determine the  $r_s$  dependence of the diagrams listed explicitly in the hand-out. Select three representative diagrams to illustrate the  $r_s$  dependence.

We will discuss these problems during the meeting on Monday, November 20, at 3pm. Andy is still doing the HF problem assigned earlier. I propose to call on Paul to do #20, Karl #21, Chris #22, and Qinghai to do #23. My suggestion is to do the problem in all details and prepare a summary to present on the blackboard on Monday.