

Physics 861 { Fall 01

Problem set 11 - Due Thursday, Dec 6

1.

Show that the Lindhard dielectric constant $\epsilon(q; \omega)$, given for instance by eq. (17.60) in Ashcroft-Mermin, reduces to $1 - \frac{\omega_p^2}{\omega^2}$ in the limit $q \rightarrow 0$ at finite ω . Obtain the next-order correction in q , which is of order q^2 . Find the (bulk) plasmon dispersion relation, to order q^2 . How does this q^2 term in $\epsilon(q; \omega)$ affect the surface plasmon-polariton dispersion relation discussed in homework 1?

2.

(a) Problem 4, page 352 of Ashcroft-Mermin.

(b) Same problem, but using the screened Coulomb potential (Thomas-Fermi screening).

3.

Problem 1, page 486, of Ashcroft-Mermin