

Homework #2: Due 9-27-2024**PHYSICS 561 - Fall 2024**

1. Problems 4.2, 5.1, 6.1, 6.2, 6.5, 7.2

2. Extra Problem:

The dispersion for a particle in the Jellium model is given by

$$\epsilon(p) = \epsilon_F^0 [x^2 - 0.663r_s F(x)], \quad (1)$$

where $x = p/p_F$ and $\epsilon_F^0 = p_F^2/2m$. Given that $F(x=0) = 1$, the dispersion is largely negative for $0 < x < 1$. You are to determine what is the significance of the negative energy region. What physically does it mean? Plotted in Fig. 6.1b is the dispersion for $r_s = 3$. What is the significance of $r_s = 3$? What happens for $r_s < 3$ and $r_s > 3$? What does this tell you about the physical state of the system for $r_s > 3$?